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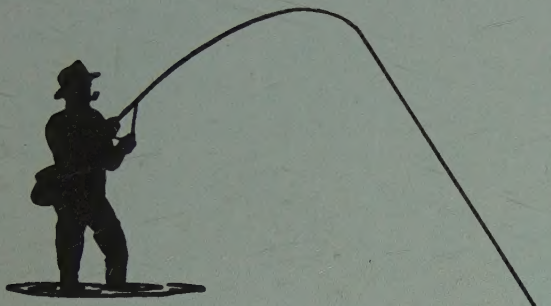

SPORT FISHERY ABSTRACTS

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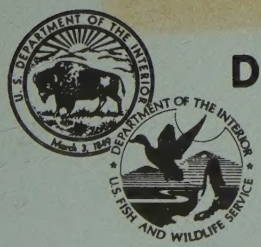

DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE

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SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

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AQUATIC PLANTS AND THEIR CONTROL

78-000001 Buglewicz, E. G.; Hergenrader, G. L. THE IMPACT OF ARTIFICIAL REDUCTION OF LIGHT ON A EUTROPHIC FARM POND. Trans. Nebr. Acad. Sci. 4: 23-33. 1977. SFA 23(1)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588] A novel technique for reducing growth of aquatic macrophytes and decreasing primary productivity in an eutrophic farm pond was evaluated by the addition of commercial blue and brown aniline dyes to pond water isolated from the surrounding pond in experimental boxes. Blue-dyed water completely eliminated all aquatic macrophytes, while brown-dyed water eliminated only /Potomogeton/ sp. Primary productivity was reduced, and phytoplankton populations similar to those observed in spring and fall pulses in lakes were present in the dyed water during the summer. Intense thermal stratification, anaerobiosis, and chemical changes were recorded in the enclosed waters after dye addition.

78-000002 Rottmann, R. MANAGEMENT OF WEEDY LAKES AND PONDS WITH GRASS CARP. Fisheries (Bull. Am. Fish. Soc.) 2 (5): 8-13. Sept.-Oct. 1977. SFA 23(1)
[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32601]

GENERAL FISH CULTURE

78-000003 Bohl, M. SOME INITIAL AQUACULTURE EXPERIMENTS IN RECIRCULATING WATER SYSTEMS. Aquaculture 11 (4): 323-328. Aug. 1977. SFA 23(1)
[Bayerische Landesanstalt fuer Wasserforschung, Aussenstelle Wielenbach, West Germany] First experiences in the management of different recirculating water systems are described after discussion of design and specification of purification plants for intensive fish farming. The problem of nitrate and nitrite concentrations in water is also analyzed. Further investigations directed at the improvement of environmental factors and economic organization of fish recirculating systems are required.

78-000004 Bull-Berg, L. PRESENT STATUS OF LAWS AND REGULATIONS CONCERNING THE ENVIRONMENT OF FISH FARMS IN FRANCE, ITALY, GERMANY, AUSTRIA, IRELAND, DENMARK AND NORWAY. Riv. It. Piscic. Ittiop. 12 (2): 37-41. Apr.-Mar.-June 1977. In English and Italian. SFA 23(1)
[Det Kgl. Selskap Norges Vel.-Rosenkrantzgt. 8, Oslo, Norway]

78-000005 McLarney, B.; Todd, J. AQUACULTURE ON A REDUCED SCALE. Commer. Fish Farmer 3 (6): 10,12-17. Sept. 1977. SFA 23(1)
[New Alchemy Inst., Box 432, Woods Hole, MA 02543]

78-000006 Parker, N. C.; Broussard, M. C., Jr. SELECTED BIBLIOGRAPHY OF WATER REUSE SYSTEMS FOR AQUACULTURE. Tex. Agric. Exp. Stn. Misc. Publ. No. 1314. 34p. June 1977. SFA 23(1)
[U.S. FWS, Southeast. Fish Cult. Lab., Marion, AL 36756] As interest in water-reuse for aquaculture has expanded there has been a corresponding demand for literature applicable to recirculating aquaculture systems. This bibliography includes 292 listings for publications dealing with either closed-culture systems or selected literature from allied fields. Entries are divided into 9 categories i.e., Freshwater Systems, Marine Systems, Environmental Factors, Waste Characterization, Sterilization, Techniques and Instrumentation, Economics, Waste Utilization, and Waste Treatment. An author index is included.

TROUT AND SALMON CULTURE

78-000007 McIntyre, J. D.; Johnson, A. K. RELATIVE YIELD OF TWO TRANSFERRIN PHENOTYPES IN COHO SALMON. Prog. Fish-Cult. 39 (4): 175-177. Oct. 1977. SFA 23(1)
[U.S. FWS, Seattle Natl. Fish. Res. Cent., Bldg. 204, Naval Support Activity, Seattle, WA 98115]

78-000008 Refstie, T. EFFECT OF DENSITY ON GROWTH AND SURVIVAL OF RAINBOW TROUT. Aquaculture 11 (4): 329-334. Aug. 1977. SFA 23(1)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 As-NLH, As Norway] Groups of rainbow trout (/Salmo gairdneri/) were kept at five different densities during an initial feeding period of 42 days and a subsequent growth period of 180 days. They were then kept at the same density for 55 days. Differences between groups in mean weights and mortality were found as early as the end of the initial feeding period. At the end of the 180-days growth period the differences in mean weight between density groups were large. Differences in condition (/K/) factor were also found at the end of this period. Groups at high densities had the lowest growth rate and /K/ factor. When groups were kept at the same density, those originally at high densities showed the highest relative growth. It is concluded that high densities depressed the growth rate, and that compensatory growth occurred when the densities were standardized. It is important to take density into account when ranking families or progeny groups for growth performance.

78-000009 Thorpe, J. E. BIMODAL DISTRIBUTION OF LENGTH OF JUVENILE ATLANTIC SALMON (/SALMO SALAR/ L.) UNDER ARTIFICIAL REARING CONDITIONS. J. Fish Biol. 11 (2): 175-184. Aug. 1977. SFA 23(1)
[Dep. Agric. Fish., Freshwater Fish. Lab., Faskally, Pitlochry, Perthshire PH16 5LB, England] In 52 populations of juvenile Atlantic Salmon, /Salmo salar/ L., from 14 pairings of wild parents, reared at the Almondbank smolt rearing station between 1973 and 1976 in circular radial-flow tanks, bimodality in the frequency distribution of length and weight has been characteristic by the first autumn of growth, and has become progressively clearer during the following winter. The examination of 13 populations showed the modes did not correspond to separate sexes, from four others it was shown they did not correspond

78-000009 CONTINUED
to immature fish and precociously mature males. It is suggested that the two modes correspond to subpopulations smoltifying at ages (/t/) and (/t/+1) years. The age-composition of the smolt-run originating from individual year-classes of salmon in four Scottish rivers was found to be consistent with stocks having size-group segregations, at the time of the first smolt emigration, similar to those found among Almondbank experimental material. It is inferred that bimodality of size distribution is the norm among sibling populations of juvenile Atlantic salmon.

78-000010 Wedemeyer, G. A. ENVIRONMENTAL REQUIREMENTS FOR FISH HEALTH. Proc. Int. Symp. Diseases Cultured Salmonids 41-55. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[U.S. Fish Wildl. Serv., West. Fish Dis. Lab., Seattle, WA]

78-000011 Westers, H.; Pratt, K. M. RATIONAL DESIGN OF HATCHERIES FOR INTENSIVE SALMONID CULTURE, BASED ON METABOLIC CHARACTERISTICS. Prog. Fish-Cult. 39 (4): 157-165. Oct. 1977. SFA 23(1)
[Mich. Dep. Nat. Resour., Lansing 48909]

78-000012 Williams, D. D.; Mundie, J. H.; Mounce, D. E. SOME ASPECTS OF BENTHIC PRODUCTION IN A SALMONID REARING CHANNEL. J. Fish. Res. Board Can. 34 (11): 2133-2141. Nov. 1977. In English with French summ. SFA 23(1)
[Div. Life Sci., Scarborough Coll., Univ. Toronto, West Hill, ON, Canada]

WARMWATER CULTURE

78-000013 Badenko, L. V.; Korniyenko, G. G.; Gashchenko, L. A.; Shchigel'skaya, V. P. STATE OF THE GONADS OF THE KUBAN SEVRYUGA /ACIPENSER STELLATUS/ BELOW THE DAM OF THE FEDOROVSKIY HYDRAULIC INSTALLATION, AND ITS SIGNIFICANCE FOR ARTIFICIAL PROPAGATION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 583-591. 1976. SFA 23(1)
[AzNIIRKh, Rostov-on-Don, USSR] A description is given of the physiological state of the Kuban sevryuga, /Acipenser stellatus/, caught at different points of the spawning route (in the river delta and below the dam of the Fedorovskiy Hydraulic Installation) and the degree of maturity of the gonads established on the basis of a study of histological sections and the biochemical formation of the oocytes. The method of selecting mature fish for commercial breeding is described. The results obtained provide a biological basis for the organization of a more controlled and efficient fish-rearing establishment in the Azov-Kuban region.

78-000014 Bhowmick, R. M.; Kowtal, G. V.; Jana, R. K.; Gupta, S. D. EXPERIMENTS ON SECOND SPAWNING OF MAJOR INDIAN CARPS IN THE SAME SEASON BY HYPOPHYSATION. Aquaculture 12 (2): 149-155. Oct. 1977. SFA 23(1)
[Cent. Inland Fish. Res. Sub-Stn., Cuttack, 753001, Orissa, India] The major Indian carps, rohu (/Labeo rohita/), catla (/Catla catla/) and mrigal (/Cirrhinus mrigala), were hitherto known to breed only once a year--during the monsoon season--either in their natural habitat or by hypophysation in captivity. It has been found possible

78-000014 CONTINUED
to mature and induce these carps to spawn twice in the same season, within an interval of about 2 months, and thus augment the spawn production. The technique in brief is as follows. (i) The fish are bred by hypophysation early during the monsoon, in June. (ii) After the first spawning, prophylactic measures are adopted. (iii) The fish are fed supplementary feed consisting of groundnut oil cake and rice bran at a ratio of 1:1 and 2-5 percent body weight of the fish. The spent fish, under favourable weather conditions, were found to mature for a second time and were ready for a second spawning, using hypophysation, in about 2 months. This finding is a breakthrough in the field of fish culture at it helps to obtain more spawn from the same specimens in one season. These results demonstrate the possibility of extending this practice to other cultivated species and thereby augmenting the supply of quality fish seed.

78-000015 Datingaling, B. Y. THE POTENTIAL OF THE CULTIVABLE FRESHWATER FISHERY RESOURCES OF THE PHILIPPINES. Philipp. Bur. Fish. Aquatic Resour. Tech. Pap. Ser. 1 (1): 1-10. May 1977. SFA 23(1)
This paper is a general review of the cultivable freshwater fishery resources of the Philippines with possible production potential when fully developed. Necessary inputs in production development are water resources, cultivable species and manpower. Although about 170 species of fish are reported from the freshwater areas of the country, this report is limited to those fishes raised in impounded waters and other species which have been successfully bred in hatcheries and found to be reasonably practicable for transplanting in inland freshwater units. Their propagation can be further increased if the government will undertake an intensive program of fishery management. Training programs on the improvement of modern techniques of fish culture for local and foreign participants have been carried out during the last five years to develop manpower resources in freshwater fisheries. The major activities being undertaken by the government for the wise use of resources to maximize production are technical assistance extension services, fish seed production, fingerling dispersal and financial aid by banking institutions.

78-000016 Guest, W. C. TECHNIQUE FOR COLLECTING AND INCUBATING EGGS OF THE FATHEAD MINNOW. Prog. Fish-Cult. 39 (4): 188. Oct. 1977. SFA 23(1)
[Texas Parks Wildl. Dep., Heart of the Hills Res. Stn., Junction Star Route, Box 62, Ingram 78025]

78-000017 Huq, M. F.; Islam, A. K. M. S. A SURVEY OF MAN-MADE WATER AREAS IN A VILLAGE IN BANGLADESH TO DETERMINE THEIR PRODUCTIVE CAPACITY, CURRENT USE AND REASONS FOR UNDER-UTILIZATION. Aquaculture 12 (1): 75-88. Sept. 1977. SFA 23(1)
[Dep. Biol., Univ. Basrah, Basrah, Iraq] To identify the reasons for under-utilization of man-made ponds in Bangladesh, and to find their productive capacity, a study of all ponds in one village in Mymensingh District was undertaken. A total water area of 7.42 ha in the village of Boyra was comprised of 116 ponds. The depth of these ponds varied seasonally with the monsoon, and most of them had medium productive capacity. the Majority were dug between 20 and 39 years ago and less than half had embankments in need of repair. Multiple ownership of ponds was common, though this was not thought to be a reason for their not being used for fish culture. Fish culture was claimed to be one of the two main reasons for construction of the ponds. However, they were mostly used for household water supply while a form of fish culture was practised by relatively few pond owners. Ponds were stocked either with fry when available from the nearby

78-000017 CONTINUED
river or by allowing fish to enter with the monsoon flood water, and harvesting occurred when fish were needed--no care was taken of fish between these two steps and owners had no knowledge of any more advanced method. Although pond owners wanted to culture fish, capital was a large problem; they did not want to be part of a co-operative. It is concluded that, with good management, Bangladesh is capable of producing 50,000 tonnes/year of fish from her freshwater ponds, whereas present production is negligible.

78-000018 Ruane, R. J.; Chu, T.-Y. J.; Vandergriff, V. E. CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH-DENSITY CATFISH CULTURES. Water Res. 11 (9): 789-800. 1977. SFA 23(1)
[Div. Environ. Planning, TVA, Chattanooga, TN] Warm condenser cooling water that is discharged from a steam-electric power plant was used to achieve optimum temperature levels for high-density production of catfish. The heated water extended the catfish growing season, enhanced growth rates, and increased production poundage. Characteristics of the wastewater from the high-density warm water culture (90 to 160 g of fish per liter of water and average water temperature of 28.2°C) were evaluated including evaluation of settleable solids, suspended solids, biochemical oxygen demand, chemical oxygen demand, total and soluble phosphates, ammonia nitrogen, organic nitrogen, nitrate and nitrate nitrogen, and fecal coliform bacteria for hourly and daily variations and for the effects of feeding on waste production. Unit waste loads were computed and compared to limits promulgated by the U.S. Environmental Protection Agency. A pilot-scale sedimentation basin was evaluated for reducing settleable solids, suspended solids, chemical oxygen demand, and phosphates. Difficulties in reducing fecal coliforms are discussed.

78-000019 Shireman, J. V.; Colle, D. E.; Rottmann, R. W. INTENSIVE CULTURE OF GRASS CARP, /CTENOPHARYNGODON IDELLA/, IN CIRCULAR TANKS. J. Fish Biol. 11 (3): 267-272. Sept. 1977. SFA 23(1)
[Sch. Forest Resour. Conserv., Univ. Fla., Gainesville] Fingerling grass carp (/Ctenopharyngodon idella/) were cultured in 380 l circular fiberglass tanks at stocking densities of 0.53, 1.06, 1.59 and 2.11 fish/l. Fish were fed duckweed (/Lemna minima/) to satiation. Fish grew from 2.7 g to a maximum mean weight of 72.7 g in 88 days. Fish stocked at 0.53 fish/l grow more rapidly than those stocked at higher densities. Mean daily consumption rates were strongly correlated with oxygen levels and when oxygen levels dropped below 4 mg/l consumption was reduced approximately 40 percent. High biomass, growth, and survival rates obtained during this study indicate grass carp are well suited for intensive tank culture.

78-000020 Thomas, A. E.; Carter, R. R. SURVIVAL OF MONOSEX GRASS CARP IN SMALL PONDS. Prog. Fish-Cult. 39 (4): 184. Oct. 1977. SFA 23(1)
[U.S. FWS, Fish Farm. Exp. Stn., Stuttgart, AR 72160]

MARICULTURE

78-000021 Hassler, W. W.; Hogarth, W. T. THE GROWTH AND CULTURE OF DOLPHIN, /CORYPHAENA HIPPURUS/, IN NORTH CAROLINA. Aquaculture 12 (2): 115-122. Oct. 1977. SFA 23(1)
[Dep. Zool., N. Car. State Univ., Raleigh 27607] Juvenile dolphin (/Coryphaena hippurus/) were captured in the vicinity of the Gulf Stream off Hatteras, N.C., and held in pens in estuarine waters. A tank was designed specifically for fish transportation. Captive fish tolerated salinities ranging from 16 to 26°/oo and temperatures ranging from 15 to 29.4°C. Separate feeding trials resulted in food conversion ratios of 3.54 and 3.44 (wet weights). Another trial involving 21 dolphin resulted in an average gain of 0.39 kg per week. Dolphin fed readily on a variety of cut fresh fish but rejected dolphin flesh. They were also trained to accept pelletized food. Dolphin have great potential for use in mariculture because of their rapid growth, palatability, good market price, and tolerance to estuarine conditions. As the growing season for dolphin does not extend for more than 6 months at Hatteras, N.C., warmer climates with year-round growing seasons are recommended for dolphin culture.

78-000022 Misitano, D. A. TECHNIQUE FOR INCUBATING AND HATCHING EGGS OF SURF SMELT FOR BIOASSAY. Prog. Fish-Cult. 39 (4): 187. Oct. 1977. SFA 23(1)
[NMFS, Northwest Fish. Cent., Seattle, WA 98112]

78-000023 Pitt, R.; Tsur, O.; Gordin, H. CAGE CULTURE OF /SPARUS AURATA/. Aquaculture 11 (4): 285-296. Aug. 1977. SFA 23(1)
[Israel Oceanogr. Limnol. Res. Ltd., Mariculture Lab., P.O. Box 1212, Elat, Israel] An experimental cage culture unit was established in El Kura Bay, Dahab, Gulf of Aqaba, in 1974. Attention has been paid to (a) testing the suitability of the gilthead sea bream, /Sparus aurata/, transferred from the Mediterranean to cage culture in a subtropical sea; (b) testing the suitability of a few local species to cage culture; (c) testing the practicality and durability of a few cage designs and materials under culture conditions. The results were as follows: (a) /S. aurata/ grew well in cages. With fish of 400 g average weight, densities of up to 150 fish/m^3 did not influence growth rate. The food conversion coefficient was poor due to loss of pellets that sank through the nets. No significant mortality occurred due to diseases or predation. (b) Of the local species which were incorporated into the experiment, /Rhabdosargus hoffara/, /Kyphosus/ sp., /Lethrinus/ spp. and /Siganus rivulatus/ exhibited good health and grew well under cage conditons. /Diplodus noct/ and /Crenidens crenidens/ were healthy but grew very little. /Siganus luridus/ suffered high mortality due to diseases (which may be related to diet). (c) Free-floating cages were found to be less convenient than cages made out of polyethylene fish netting, suspended from a raft. This later system appeared to be the most practical combination of fish culture. Fouling was heavier during the summer months. Predation by large fish was insignificant.

FEEDS, FEEDING AND NUTRITION

78-000024 Appelbaum, S. GEEIGNETER ERSATZ FUER LEBENDNAHRUNG VON KARPFENBRUT? [A POSSIBLE SUBSTITUTE FOR LIVE FOOD OF CARP FRY?] Arch. Fischereiwiss. 28 (1): 31-43. July 1977. In German with English summ. SFA 23(1)

[Zool. Inst., Univ. Hamburg, West Germany] It was investigated whether the yeast /Candida lipolytica/ (growing on n-paraffin hydrocarbon), in a pulverised form, could be used as a suitable substitute first feed for live nutrient of carp fry from the very beginning of food intake until conventional food can be used. It was found that for the first 10 days of life this yeast is a possible first nutrient due to its structure, its properties in water, the good intake by the fry as well as growth results.

78-000025 Beck, H.; Koops, H.; Tiews, K.; Gropp, J. WEITERE MOEGLICHKEITEN DES FISCHMEHL-ERSATZES IM FUTTER FUER REGENBOGENFORELLEN: ERSATZ VON FISCHMEHL DURCH ALKANHEFE UND KRILLMEHL. [FURTHER POSSIBILITIES TO REPLACE FISH MEAL IN RAINBOW-TROUT FEEDS: REPLACEMENT OF FISH MEAL BY ALKANE YEAST AND KRILLMEAL.] Arch. Fischereiwiss. 28 (1): 1-17. July 1977. In German with English summ. SFA 23(1)

[Univ. Munchen, West Germany] Compared with a control diet with 35 percent fish meal and 35 percent of a mixture of hydrolysed feather meal and poultry by-product meal the fish meal could be replaced by alkane yeast or krillmeal without changing gain or feed efficiency. Alkane yeast or krillmeal as sole protein sources depressed growth and feed efficiency by 3 resp. 10 percent.

78-000026 Boonyaratpalin, M.; Lovell, R. T. DIET PREPARATION FOR AQUARIUM FISHES. Aquaculture 12 (1): 53-62. Sept. 1977. SFA 23(1)

[Bangken Fish. Res. Stn., Minist. Fish., Inland Fish. Div., Bangkok, Thailand] Several ingredient combinations were processed into flaked diets and evaluated for desirable physical properties. Subsequently, drum-dried flake formulations were prepared and fed to three species of aquarium fish and evaluated for nutritional quality, palatability and color enhancement in the fish. Optimum processing parameters for drum drying flaked diets were determined. Results indicated that flaked diets for aquarium fish, which are palatable, nutritious, water stable, buoyant, crumble resistant and pigment enhancing, can be prepared from relatively inexpensive, simple ingredient combinations by carefully controlling processing parameters with a drum dryer. Functional ingredients are shrimp waste meal, for hydrocolloidal properties; fish meal, for nutritional value and palatability; soybean meal as the primary protein source; grain by-product to supply starch and fiber; fish oil for palatability and water stability; and a concentrated pigment source. Important processing factors are fine grinding of ingredients, optimum solids content of the puree, and minimum heat exposure in drying.

78-000027 Dabrowski, K. PROTEIN REQUIREMENTS OF GRASS CARP FRY (/CTENOPHARYNGODON IDELLA/ VAL.). Aquaculture 12 (1): 63-73. Sept. 1977. SFA 23(1)

[Limnol. Lab., New Univ. Ulster, Traad Point, Drumenagh, Magherafelt, Co. Derry, Northern Ireland] The study was aimed at determining the optimal level of protein in a casein diet for grass carp. There was a linear relationship between the percentage of protein in the diet and the increase in fish protein and weight up to optimal levels of 41 and 43 percent, respectively. No further increase in fish protein or weight was noted with diets containing up to 64 percent of protein. However, if the optimal level was defined by the parabolic curve with the formula $y = 36.21 + 6.2388x-0.0596x^2$, it would equal 52.6 ± 1.93 percent. Net protein utilization (NPU) values for experimental diets were obtained using a formula which took the maintenance nitrogen metabolism on a non-protein diet into consideration. This NPU formula was related to the length of the experiment, difference in the weight of fish at the beginning of the experiment, and growth of fish fed protein diets. Both protein efficiency ratio (PER) and NPU decreased with the increase in protein content of the diets according to the formulae $y = 1.966-0.018x$ and $y = 40.8-0.327x + 302.6/x$, respectively.

78-000028 Hilton, J. W.; Cho, C. Y.; Slinger, S. J. EVALUATION OF THE ASCORBIC ACID STATUS OF RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 34 (11): 2207-2210. Nov. 1977. In English with French summ. SFA 23(1)

[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-000029 Pfeffer, E.; Becker, K. UNTERSUCHUNGEN AN REGENBOGENFORELLEN UEBER DEN FUTTERWERT VERSCHIEDENER HANDELSFUTTER UND UEBER DEN WEITGEHENDEN ERSATZ VON FISCHMEEL DURCH KRILLMEHL IM FUTTER. [STUDIES ABOUT THE FEEDING VALUE OF SOME CCMMEFCIAL TROUT FEEDS AND ABOUT REPLACING A MAJOR PART OF FISH MEAL BY KPILL MEAL IN TROUT FEED.] Arch. Fischereiwiss. 28 (1): 19-29. July 1977. In German with English summ. SFA 23(1)

[Univ. Gottingen, West Germany] Eight ccmmercial trout feeds were each fed to groups of 1200 and of 900 trout in ponds, the average initial weights of which were 108 and 159 g per trout respectively. Protein contents of the feeds ranged between 39 and 55 percent of the dry matter. During 114 feeding days 350 kg feed were supplied to ponds with smaller trout and 385 kg feed to ponds with bigger trout. Gains per Mcal gross energy ranged between 142 and 167 g with no obvious influence of the level of protein in the feed. Per g of dietary protein between 1.54 and 2.20 g live weight were gained, the greatest value corresponding to the lowest level of protein in the feed (39.2 percent of d.m.). In a second experiment 2000 trout with an average initial weight of 103 g were kept in each of four ponds. To two of the ponds a feed was supplied containing 50 percent fish meal and 13 percent carcass meal. The feed of the other two ponds contained only 17.5 percent fish meal and 7.5 percent carcass meal but 40 percent krill meal. From representative samples of feed and of trout both at the beginning and at the end of the experiment balances were calculated for dietary energy and protein. 35 and 37 percent of the gross energy of the two diets were recovered in the gain and 33.5 and 34.6 percent of the dietary protein.

78-000030 Ricerca, S. D. RISULTATI PRELIMINARI DE SOSTITUZIONE COMPUTERIZZATA DELLA FARINA DI PESCE CON TROPINA NEI PELLETS PER TROTA. [PRELIMINARY RESULTS OF COMPUTERIZED COMPOSITION OF FISH FOOD WITH TOPRINA IN PELLETS FOR TROUT.] Riv. It. Piscic. Ittiop. 12 (3): 69-72. July-Aug.-Sept. 1977. In Italian with English summ. SFA 23(1)
[Ist. Zooprof. Spec. Via Bologna 148, 10100 Torino, Italy] The authors have tested, on 4,000 rainbow trout, commercial trout pellets containing "TOPRINA" (proteins obtained from yeasts grown on hydrocarbons) at 10, 20, 30 percent. The product was added in the pellet formulation after computerizing its composition to maintain the chemical strucuture necessary for trout nutrition. This addition gave good results (good conversion rates) particularly in the first period of growing (trout fingerlings), when higher caloric values are requested. The high contents of n-paraffins in the flesh of trout fed with TOPRINA-pellets, may suggest to limit its employ to the fingerling stages. Further research is wanted for the finishing periods.

78-000031 Rumsey, G. L. FISH NUTRITION--RECENT ADVANCES. Proc. Int. Symp. Diseases Cultured Salmonids 16-40. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Tunison Lab., Cortland, NY]

78-000032 Savitz, J.; Albanese, E.; Evinger, M. J.; Kolasinski, P. EFFECT OF RATION LEVEL ON NITROGEN EXCRETION, NITROGEN RETENTION AND EFFICIENCY OF NITROGEN UTILIZATION FOR GROWTH IN LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/). J. Fish Biol. 11 (2): 185-192. Aug. 1977. SFA 23(1)
[Biol. Dep., Loyola Univ. Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626] Largemouth bass (/Micropterus salmoides/) with an average weight of 45.5 g were used to study ration level effects on nitrogen excretion, nitrogen retention, and gross efficiency of utilization of nitrogen for growth. Bass were starved 3 to 4 days and then each bass was placed into an aquarium containing a known volume of water. One day after the fishes were placed in aquaria, nitrogen excretion rates were determined; this rate is the maintenance nitrogen excretion. Each fish was then fed one or more shiners (/Notropis cornutus/); fish were fed only once. Nitrogen excretion measurements were made daily until the rates were similar to maintenance rates. The nitrogen excretion rates for each day after feeding which were above the maintenance nitrogen excretion were combined and reflect the total nigrogen excretion for a given ration level. All ration levels were converted to nitrogen consumption in mg and nitrogen absorption was calculated from subtracting the average faecal nitrogen from nitrogen consumption. From data on nitrogen consumption, nitrogen absorption, nitrogen excretion, and faecal nitrogen, calculations were made for nitrogen retention and gross efficiency for utilization of nitrogen for growth. As ration level and nitrogen absorption increaed, nitrogen excretion increased and is described by the equation, /Y/ = 8.56+0.40 /X/, where /Y/ is total nitrogen excretion and /X/ is nitrogen absorption. Nitrogen retention also increased with nitrogen absorption and is described by the equation, /Y/ = -8.57+0.60 /X/, where /Y/ is nitrogen retention and /X/ is nitrogen absorption. Efficiency increases rapidly above maintenance, but levels off at higher ration levels and approaches an asymptote of 60 percent.

78-000033 Shcherbina, M. A.; Trofimova, L. N.; Kazlauskene, O. P. THE ACTIVITY OF PROTEASE AND THE RESORPTION INTENSITY OF PROTEIN WITH THE INTRODUCTION OF DIFFERENT QUANTITIES OF FAT INTO THE FOOD OF THE CARP /CYPRINUS CARPIO/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 632-636. 1976. SFA 23(1)

[VNIIPRKh, Rybnoye settlement, Moscow Province, USSR] A study on adaptive changes in the activity of proteolytic enzymes and absorption intensity of products of hydrolysis of crude protein in connection with a differing fat content in the diet was carried out in yearling carp. It is established that as a result of the introduction of fat into the food, the quantity of protein substances entering the organism from the digestive tract increases, though the influence of different quantities of fat on the activity of the proteolytic enzymes is not identical in the different divisions of the digestive system.

78-000034 Takeuchi, T.; Watanabe, T. EFFECT OF EICOSAPENTAENOIC ACID AND DOCOSAHEXAENOIC ACID IN POLLOCK LIVER OIL ON GROWTH AND FATTY ACID COMPOSITION OF RAINBOW TROUT. Bull. Jpn. Soc. Sci. Fish. 43 (8): 947-953. Aug. 1977. SFA 23(1)

[Lab. Fish Nutr., Tokyo Univ. Fish., Konan, Minato-ku, Tokyo, Japan] A feeding experiment was conducted to compare the effects of eicosapentaenoic acid (20:5omega3) and docosahexaenoic acid (22:6omega3) with that of linolenic acid (18:3omega3) on growth and fatty acid composition of rainbow trout. The growth rate was much reduced in fish kept on a diet containing 0.5 percent 18:3omega3. The replacement of 0.5 percent 18:3omega3 with either 0.5 percent 20:5omega3 or 0.5 percent 22:6omega3 markedly increased the growth rate. This result indicates that 20:5omega3 has the same growth enhancing effect as 22:6omega3 and that not only 22:6omega3 but also 20:5omega3 has an EFA efficiency higher than 18:3omega3. The best weight gain was obtained in fish on a diet containing 0.25 percent of each of 20:5omega3 and 22:6omega3 respectively, indicating an additive effect between 20:5omega3 and 22:6omega3 on the growth of rainbow trout. The ratio of 20:3omega9 to 22:6omega3 in livers, an EFA index of rainbow trout, appeared as a low value, 0.4-0.5, in the fish fed diets containing either 20:5omega3 or 22:6omega3. This indicates a nearly normal EFA status, whereas the ratio of the fish receiving 0.5 percent 18:3omega3 was 0.8, which indicates an insufficient EFA status. Thus it has been demonstrated that both 20:5omega3 and 22:6omega3 have a biological efficiency or an EFA efficiency higher than that of 18:3omega3 and that the growth enhancing effect of pollock liver oil is due to an additive effect between 20:5omega3 and 22:6omega3 in its fatty acid fraction.

78-000035 Wurtsbaugh, W. A.; Davis, G. E. EFFECTS OF TEMPERATURE AND RATION LEVEL ON THE GROWTH AND FOOD CONVERSION EFFICIENCY OF /SALMO GAIRDNERI/, RICHARDSON. J. Fish Biol. 11 (2): 87-98. Aug. 1977. SFA 23(1)

[Dep. Wildl. Fish., Univ. Calif., Davis 95616] The effects of temperature and ration size on the growth rate and gross efficiency of food conversion of juvenile rainbow trout /Salmo gairdneri/ were evaluated during 25-day seasonal experiments. Rations ranged from near-starvation to repletion levels. Test temperatures were 3 and 6°C higher than the controls which fluctuated dielly and seasonally. At rations near maintenance, elevated temperatures decreased trout growth. As the feeding rate increased the detrimental effect of temperature on growth was ameliorated. At repletion feeding levels, elevated temperature up to 17°C improved trout growth by increasing the maximum food consumption rate. With a temperature increase from 6.9 to 22.5°C maintenance rations increased from 2.2 to 7.5 percent body weight per day. Gross efficiency was dependent upon ration level

78-000035 CONTINUED
and temperature. As the food consumption rate increased, efficiency increased to a maximum, then generally declined at repletion levels. Elevated temperatures resulted in reduced efficiencies at low consumption rates but temperatures had little effect at high ration levels. A field study provided estimates of the food consumption relationships established in the laboratory, suggested any substantial increase of stream temperature without a concomitant increase of food abundance would result in decreased trout production.

78-000036 Wurtsbaugh, W. A.; Davis, G. E. EFFECTS OF FISH SIZE AND RATION LEVEL ON THE GROWTH AND FOOD CONVERSION EFFICIENCY OF RAINBOW TROUT, /SALMO GAIRDNERI/ RICHARDSON. J. Fish Biol. 11 (2): 99-104. Aug. 1977. SFA 23(1)
[Dep. Wildl. Fish., Univ. Calif., Davis 95616] The growth rates of rainbow trout, /Salmo gairdneri/, which ranged in size from 0.6 to 5.2 g and were provided rations of three different sizes, were measured during a 15-day study. The relative maintenance rations (food/gram of fish at zero growth rate) decreased with increases of fish size. Consequently when fish were kept at low ration levels the growth rates and gross efficiencies of food conversion of 'large' fish were greater than those of 'small' fish. However, as ration level increased, the effects of fish size grew at the same rates or slower than small fish. With increases of ration to the highest levels (9-12 percent/day) gross efficiency values for large fish began to decline while those for small fish continued to increase.

TRANSPORTING FISH

78-000037 Coetzee, N.; Hattingh, J. EFFECTS OF SODIUM CHLORIDE ON THE FRESHWATER FISH /LABEO CAPENSIS/ DURING AND AFTER TRANSPORTATION. Zool. Afr. 12 (1): 244-247. 1977. SFA 23(1)
[Dep. Physiol., Univ. Witwatersrand, South Africa]

78-000038 Long, C. W.; McComas, J. R.; Monk, B. H. USE OF SALT (NACL) WATER TO REDUCE MORTALITY OF CHINOOK SALMON SMOLTS, /ONCORHYNCHUS TSHAWYTSCHA/, DURING HANDLING AND HAULING. Mar. Fish. Rev. 39 (7): 6-9. July 1977. SFA 23(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] /A major research program on the Columbia and Snake Rivers is designed to increase survival of juvenile salmon and trout by capturing them at an upriver dam, transporting them around a series of dams, and releasing them into the Columbia River. Excellent results have been obtained with steelhead trout, /Salmo gairdneri/. However, the mortality of chinook salmon, /Oncorhynchus tshawytscha/, immediately following their transportation has adversely affected the percentage that return as adults. In a small-scale study conducted in 1975 at Bonneville Dam, adding salt (NaCl) to the water during handling and hauling increased the survival of juvenile chinook salmon and protected test fish against /Saprolegnia/ spp., a fungus that infected several of the control fish. The addition of salt to the water in future transportation studies should reduce delayed mortality of juvenile chinook salmon and thereby increase the percentage that return as adults.

ENVIRONMENTAL ISSUES, GENERAL AND MISC.

78-000039 Armour, C. L. HOW THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) CAN BE THWARTED--POSSIBLE CORRECTIVE MEASURES. Fisheries (Bull. Am. Fish. Soc.) 2 (4): 14-17. July-Aug. 1977. SFA 23(1)
In response to burgeoning public concern for environmental amenities, the National Environmental Policy Act (NEPA) was promulgated. Drafters of the landmark legislation intended that environmental factors would receive equitable consideration when governmental decisions are to be rendered about proposed actions on applications in the industrial sector; i.e., applications by corporations whose proposed projects require Environmental Impact Statements. However, it is possible for applications to circumvent the spirit and legal intent of the Act to achieve short-term profit-oriented objectives at the expense of environmental quality. In this paper, some approaches for thwarting the Act are addressed in addition to possible measures for correcting short-commings in the NEPA process.

78-000040 Graves, F. M.; Bretsch, H. P.; Glover, F. A.; Miller, C. A.; Berger, M. E. ENERGY, PUBLIC CHOICES AND ENVIRONMENTAL DATA NEEDS. U.S. Fish Wildl. Serv. FWS/OBS-77/04. 126p. Mar. 1977. SFA 23(1)
[Inst. Public Admin., 1717 Massachusetts Ave., N.W., Washington, DC 20036] The report describes the energy-related decision processes of the Bureau of Land Management, Geological Survey, Forest Service, Bureau of Reclamation, Energy Research and Develcpment Administration, Water Resources Council, and the States of Montana, New Mexico, Utah, Colorado and Wyoming. On the Basis of formal decision processes and interviews with numerous agency personnel recommendations are made whereby the Fish and Wildlife Service can more effectively communicate wildlife information to decision makers.

CHEMICAL LIMNOLOGY AND OCEANOGRAPHY

78-000041 Barica, J. EFFECT OF FREEZE-UP ON MAJOR ION AND NUTRIENT CONTENT OF A PRAIRIE WINTERKILL LAKE. J. Fish. Res. Board Can. 34 (11): 2210-2215. Nov. 1977. In English with French summ. SFA 23(1)
[Fish. Mar. Serv., Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

78-000042 Levy, E. M.; Cunningham, C. C.; Conrad, C. D. W.; Moffatt, J. D. A TITRATION APPARATUS FOR THE DETERMINATION OF DISSOLVED OXYGEN IN SEAWATER. J. Fish. Res. Board Can. 34: (11): 2218-2220. Nov. 1977. In English with French summ. SFA 23(1)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-000043 Paradis, M.; Ackman, R. G. INFLUENCE OF ICE COVER AND MAN ON THE ODD-CHAIN HYDROCARBONS AND FATTY ACIDS IN THE WATERS OF JEDDORE HARBOUR, NOVA SCOTIA. J. Fish. Res. Board Can. 34 (11): 2156-2163. Nov. 1977. In English with French summ. SFA 23(1)
[R. G. Ackman: Dep. Fish. Environ., Fish. Mar. Serv., Halifax Lab., Halifax, NS B3T 2R3, canada]

BENTHOS

78-000044 Armitage, P. D. DEVELOPMENT OF THE MACRO-INVERTEBRATE FAUNA OF COW GREEN RESERVOIR (UPPER TEESDALE) IN THE FIRST FIVE YEARS OF ITS EXISTENCE. Freshwater Biol. 7 (5): 441-454. Oct. 1977. SFA 23(1)
[Freshwater Biol. Assoc., Windermere Lab., Cow Green Unit, Cumbria, England]

78-000045 Dermott, R. M.; Kalff, J.; Leggett, W. C.; Spence, J. PRODUCTION OF /CHIRONOMUS/, /PROCLADIUS/, AND /CHAOBORUS/ AT DIFFERENT LEVELS OF PHYTOPLANKTON BIOMASS IN LAKE MEMPHREMAGOG, QUEBEC-VERMONT. J. Fish. Res. Board Can. 34 (11): 2001-2007. Nov. 1977. In English with French summ. SFA 23(1)
[Fish. Mar. Serv., Great Lakes Biolimnol. Lab., Burlington, ON L7R 4A6, Canada]

78-000046 Koosman, V. W.; Newburg, H. J. MODIFICATION OF THE WATER FLOTATION METHOD FOR SEPARATING ORGANISMS FROM DETRITUS IN BENTHIC SAMPLES. Prog. Fish-cult. 39 (4): 189-190. Oct. 1977. SFA 23(1)
[Minn. Dep. Nat. Resour., St. Paul 55155]

78-000047 Minto, M. L. A SAMPLING DEVICE FOR THE INVERTEBRATE FAUNA OF AQUATIC VEGETATION. Freshwater Biol. 7 (5): 425-430. Oct. 1977. SFA 23(1)
[Dep. Zool., Univ. Glasgow, Scotland] A sampler designed to provide a quantitative estimate of the benthic invertebrates of littoral/sub-littoral zones dominated by /Sphagnum/ moss is described. Data obtained from a small oligotrophic lake at a depth of 1 m using this sampler are presented. Optimum sampler size was determined and samples comprising five sampling units were found to be adequate in terms of the number of invertebrate species present and their relative abundance. Similarity of such samples was greater than 90 percent.

78-000048 Momot, W. T.; Gowing, H. PRODUCTION AND POPULATION DYNAMICS OF THE CRAYFISH /ORCONECTES VIRILIS/ IN THREE MICHIGAN LAKES. J. Fish. Res. Board Can. 34 (11): 2041-2055. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Lakehead Univ., Thunder Bay, ON P7B 5E1, Canada]

78-000049 Momot, W. T.; Gowing, H. RESULTS OF AN EXPERIMENTAL FISHERY ON THE CRAYFISH /ORCONECTES VIRILIS/. J. Fish. Res. Board Can. 34 (11): 2056-2066. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Lakehead Univ., Thunder Bay, ON P7B 5E1, Canada]

78-000050 Pawson, D. L. MARINE FLORA AND FAUNA OF THE NORTHEASTERN UNITED STATES. ECHINODERMATA: HOLOTHUROIDEA. NOAA Tech. Rep. NMFS Circ. 405. iii + 15p. Sept. 1977. SFA 23(1)
[Dep. Invert. Zool., Smithsonian Inst., Washington, DC 20560] The holothurian fauna of the east coast of the United States from southern New Jersey to Nova Scotia, to depths of 200 m. comprises 21 species in 17 genera and 8 families. An introduction to the general biology and morphology of the holothurians, systematic characters and examination procedures, and a selected bibliography are included, together with an

78-000050 CONTINUED
illustrated key to the species, an annotated systematic list, and an index. Affinities of this fauna are chiefly boreal; some species also occur south of Cape Hatteras, while others are essentially Arctic in distribution.

78-000051 Swanson, G. A. SELF-CLEANING SCREEN FOR PROCESSING BENTHIC SAMPLES. Prog. Fish-Cult. 39 (4): 177-178. Oct. 1977. SFA 23(1)
[North. Prairie Wildl. Res. Cent., Jamestown, ND 58401]

PLANKTON

78-000052 Dobias, M. L. MICROFILM READER FOR ZOOPLANKTON STUDIES. Prog. Fish-Cult. 39 (4): 174. Oct. 1977. SFA 23(1)
[Biol. Dep., Lake Superior State Coll., Sault Ste. Marie, MI 49783]

78-000053 Heberger, R. F.; Reynolds, J. B. ABUNDANCE, COMPOSITION, AND DISTRIBUTION OF CRUSTACEAN ZOOPLANKTON IN RELATION TO HYPOLIMNETIC OXYGEN DEPLETION IN WEST-CENTRAL LAKE ERIE. U.S. Fish Wildl. Serv. Tech. Pap. 93. 17p. 1977. SFA 23(1)
[U.S. FWS, 1451 Green Rd., Ann Arbor, MI 48105]

MORPHOLOGY

78-000054 Adeney, R. J.; Hughes, G. M. SOME OBSERVATIONS ON THE GILLS OF THE OCEANIC SUNFISH, /MOLA MOLA/. J. Mar. Biol. Assoc. U.K. 57 (3): 825-837. Aug. 1977. SFA 23(1)
[Cent. Overseas Pest Res., 56, Grays Inn Road, London WC1X 8LU, England]

78-000055 Ainis, L. ANATOMIA COMPARATA DELL-APPARATO BRANCHIALE E DELLA TIROID DI PESCI OSSEI. [COMPARATIVE ANATOMY OF THE BRANCHIAL APPARATUS AND THE THYROID OF TELEOSTEAN FISHES.] Riv. Biol. Norm. Patol. 3 (1): 21-33. 1977. In Italian with English summ. SFA 23(1)
[Ist. Zool. Anat. Comp., Univ. Messina, Italy]

78-000056 Ali, M. A.; Anctil, M. RETINAL STRUCTURE AND FUNCTION IN THE WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND SAUGER (/S. CANADENSE/). J. Fish. Res. Board Can. 34 (10): 1467-1474. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Univ. Montreal, Montreal, PQ H3C 3J7, Canada]

78-000057 Anctil, M.; Ali, M. A. RETINAL STRUCTURE IN /SYNBRANCHUS MARMORATUS/ WITH OBSERVATIONS ON TWO NEW CONE MYOID INCLUSIONS. Rev. Can. Biol. 36 (2): 113-127. June 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Univ. Montreal, C.P. 6128, Succ. A, Montreal, PQ H3C 3J7, Canada]

78-000058 Bjerring, H. C. A CONTRIBUTION TC STRUCTURAL ANALYSIS OF THE HEAD OF CRANIATE ANIMALS. THE ORBIT AND ITS CONTENTS IN 20-22-MM EMBRYOS OF THE NORTH AMERICAN ACTINOPTERYGIAN /AMIA CALVA/ L., WITH PARTICULAR REFERENCE TO THE EVOLUTIONARY SIGNIFICANCE OF AN ABERRANT, NONOCULAR, ORBITAL MUSCLE INNERVATED BY THE OCULOMOTOR NERVE AND NOTES ON THE METAMERIC CHARACTER OF HEAD IN CRANIATES. Zool. Scr. 6 (2): 127-183. 1977. In English with French and Russian summ. SFA 23(1)
[Sect. Palaeozool., Swedish Mus. Nat. Hist., Stockholm] An attempt has been made to reconcile a hitherto unknown, nonocular, orbital muscle in the embryology of the North American actinopterygian fish /Amia calva/ L. with the basic morphological theme which pervades the cephalic division of crainiate animals. It is concluded, among other things, that this somatic muscle innervated by the oculomotor nerve represents the basicranial muscle of the second, or premandibular, metamere and that it is homologous with the eye stalk in elasmobranchs as well as with the basiorbital in embryonic lampreys.

78-000059 Child, A. R.; Solomon, D. J. OBSERVATIONS ON MORPHOLOGICAL AND BIOCHEMICAL FEATURES OF SOME CYPRINID HYBRIDS. J. Fish Biol. 11 (2): 125-131. Aug. 1977. SFA 23(1)
[Fish. Lab., MAFF, Pakefield Rd., Lowestoft, Suffolk NR33 OHT, England] Roach, rudd and bream and hybrids between roach X rudd and roach X bream have been examined morphologically and by electrophoretic separation of their serum proteins. Identification by both methods agree and it is suggested biochemical methods of identification may be of value in cases of difficulty when distinguishing hybrids by morphological methods.

78-000060 Donato, A.; Contini, A.; Gianneto, S.; Mauceri, A. ASPETTI CITOCHIMICI DEGLI OVOCITI DI /LEPIDOPUS CAUDATUS/ EUFRASEN (PISCES: TRICHIURIDAE) NEL CORSO DEL LORO ACCRESCIMENTO. [CYTOCHEMICAL ASPECTS OF THE GROWING OOCYTES OF /LEPIDOPUS CAUDATUS/ EUFRASEN (PISCES: TRICHIURIDAE).] Riv. Biol. Norm. Patol. 3 (2): 49-69. 1977. SFA 23(1)
[Ist. Zool., Anat. Comp., Univ. Messina, Italy]

78-000061 Doyle, M. J. A MORPHOLOGICAL STAGING SYSTEM FOR THE LARVAL DEVELOPMENT OF THE HERRING, /CLUPEA HARENGUS/ L. J. Mar. Biol. Assoc. U.K. 57 (3): 859-867. Aug. 1977. SFA 23(1)
[Dep. Biol., Southampton Univ., Med. Biol. Sci. Bldg., Bassett Crescent East, Southampton SO9 3TU, England] A staging system for the larval development of the herring (/Clupea harengus/), based upon external morphology is described. The principal criterion of each stage is as follows: stage 1, yolksac morpholcgy; stage 2, differentiation of the dorsal fin; stage 3, dorsal upturn of the posterior tip of the notochord, and stage 4, relative shortening of the gut. Larvae were reared to metamorphosis from artificially fertilized eggs and regularly sampled. A typical specimen in each substage was drawn and the durations of the substages were estimated at laboratory water and sea-surface temperatures. Rapid staging of lightly anaesthetized larvae, which could then be used in experiments, was possible.

78-000062 Ehinger, B.; Holmberg, K.; Ohman, P. AMINERGIC AND INDOLEAMINE ACCUMULATING NEURONS IN THE RETINA OF THE RIVER LAMPREY (/LAMPETRA FLUVIATILIS/). Acta Zool. (Stockh.) 58 (3): 117-123. 1977. SFA 23(1)
[Dep. Ophthalmol. Histol., Univ. Lund, Sweden]

78-000063 Fange, R. SIZE RELATIONS OF LYMPHOMYELCID ORGANS IN SOME CARTILAGINOUS FISH. Acta Zool. (Stockh.) 58 (3): 125-128. 1977. SFA 23(1)
[Dep. Zoophysiol., Univ. Goteborg, Sweden]

78-000064 Haaker, P. L. ABNORMAL VERTEBRAL DEVELOPMENT IN NORTHERN ANCHOVY, /ENGRAULIS MORDAX/ GIRARD. Calif. Fish Game 63 (3): 182-185. July 1977. SFA 23(1)
[Mar. Resour. Reg., Dep. Fish Game, 350 Golden Shore, Long Beach, CA 90802]

78-000065 Iwai, T.; Hughes, G. M. PRELIMINARY MORPHOMETRIC STUDY ON GILL DEVELOPMENT IN BLACK SEA BREAM (/ACANTHOPAGRUS SCHLEGELI/). Bull. Jpn. Soc. Sci. Fish. 43 (8): 929-934. Aug. 1977. SFA 23(1)
[Dep. Fish., Kyoto Univ., Kyoto, 606 Japan] The surface to volume ratio for the gill system was examined in larvae of the black sea bream by using positive transparencies of serial sections projected on a rectilinear grid. Morphometric data showed that the ratio for gill filaments decreases markedly at the transitional stage from yolk sac to exogenous food source. Larvae at the end of the yolk sac stage probably have considerable difficulties with gill respiration, as well as food searching.

78-000066 Korovina, V. M. ANATOMICAL AND HISTOLOGICAL FEATURES OF THE MIDGUT OF THE RAINBOW TROUT /SALMO GAIRDNERI/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 617-624. 1976. SFA 23(1)
[Ichthyol. Lab., Zool. Inst., USSR Acad. Sci., Leningrad, USSR] The structure of the midgut of the rainbow trout, /Salmo gairdneri/, was investigated in the anterior division immediately beyond the last pyloric cecum and in the posterior division. In the anterior division, the midgut is relatively narrow and the folds are longitudinal. The posterior part, constituting approximatley one third of the total length of the entire midgut, is expanded and contains a spiral fold which, according to its anatomical and histological features, is a genuine spiral valve.

78-000067 Love, R. M.; Munro, L. J.; Robertson, I. ADAPTATION OF THE DARK MUSCLE OF COD TO SWIMMING ACTIVITY. J. Fish Biol. 11 (5): 431-436. Nov. 1977. SFA 23(1)
[Torry Res. Stn., Aberdeen, Scotland] After cod (/Gadus morhua/ L.) had been exercised in a channel, the intensity of pigmentation of the dark muscle was shown to be greater than in unexercised controls. A well-marked seasonal cycle in pigmentation occurs in cod caught near Aberdeen with a summer maximum suggesting maximal feeding activity. The possibility of using the observation to identify stocks of fish is considered.

78-000068 Manion, P. J.; Piavis, G. W. DENTITION THROUGHOUT THE LIFE HISTORY OF THE LANDLOCKED SEA LAMPREY, /PETROMYZON MARINUS/. Copeia 1977 (4): 762-766. 25 Nov. 1977. SFA 23(1)
[U.S. FWS, Sea Lamprey Control Stn., Marquette, MI 49855]

78-000069 Mosse, P. R. L.; Hudson, R. C. L. THE FUNCTIONAL ROLES OF DIFFERENT MUSCLE FIBRE TYPES IDENTIFIED IN THE MYOTOMES OF MARINE TELEOSTS: A BEHAVIOURAL, ANATOMICAL AND HISTOCHEMICAL STUDY. J. Fish Biol. 11 (5): 417-430. Nov. 1977. SFA 23(1)
[Dep. Zool., Univ. Melbourne, Parkville, Victoria, Australia]

78-000070 Nikol'skiy, G. V.; Kanevskaya, N. K.; Tryapitsyna, L. N. CERTAIN PATTERNS OF CHARACTER VARIABILITY OF FISH FROM DIFFERENT FAUNISTIC GROUPINGS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 536-542. 1976. SFA 23(1)
[IEMEZh, USSR Acad. Sci., Moscow, USSR] Patterns in the variability of fish from different faunistic groupings are demonstrated and an analysis carried out of the variability of the morphological characters of fish in fresh and sea waters; the variability of characters in fish within a single geographical zone is examined in relation to habitat conditions.

78-000071 Ovcharov, O. P. FEATURES OF THE FLOW AROUND THE BODY OF THE SEVRYUGA /ACIPENSER STELLATUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 682-686. 1976. SFA 23(1)
[InBYuM, Sevastopol, USSR]

78-000072 Popper, A. N. A SCANNING ELECRON MICROSCOPIC STUDY OF THE SACCULUS AND LAGENA IN THE EARS OF FIFTEEN SPECIES OF TELEOST FISHES. J. Morphol. 153 (3): 397-418. Sept. 1977. SFA 23(1)
[Dep. Zool., Lab. Sens. Sci., Univ. Hawaii, Honolulu 96822]

78-000073 Stasiak, R. H. MORPHOLOGY AND VARIATION IN THE FINESCALE DACE, /CHROSOMUS NEOGAEUS/. Copeia 1977 (4): 771-774. 25 Nov. 1977. SFA 23(1)
[Dep. Biol., Univ. Nebr., Omaha 68101]

78-000074 Stroband, H. W. J. GROWTH AND DIET DEPENDANT STRUCTURAL ADAPTATIONS OF THE DIGESTIVE TRACT IN JUVENILE GRASS CARP (/CTENOPHARYNGODON IDELLA/, VAL.). J. fish Biol. 11 (2): 167-174. Aug. 1977. SFA 23(1)
[Agric. Univ., Dep. Exp. Anim. Morphol. Cell. Biol., Hollandseweg 13, Wageningen, The Netherlands] The morpholcgy of the intestinal epithelium is described and compared with published data. In the gut of this stomachless fish, three zones can be distinguished based on light and electron microscopic observations of absorptive cells; a rostral zone with numerous fat droplets, a second zone with large P.A.S.-positive supranuclear vacuoles and pinocytotic vesicles, and a third zone without these characteristics. In these zones deep invaginations of the cell membrane is a feature of the basal part of the cells. The presence of pinocytotic vesicles in the second zone is considered evidence of the uptake of undigested protein-like substances. Juvenile grass carp from 15 to 335 days, fed on either animal or vegetable food, were measured. The growth rates indicate that animal food stimulates rapid growth. The data also show a vegetable diet causes a slight increase in relative gut length, mainly in the length of the first zone.

78-000075 Tamura, E.; Honma, Y. HISTOLOGICAL CHANGES IN THE ORGANS AND TISSUES OF THE GOBIID FISHES THROUGHOUT THEIR LIFE-SPAN--VIII. SEASONAL CHANGES IN THE THYMUS OF FOUR SPECIES OF GOBIES. Bull. Jpn. Soc. Sci. Fish. 43 (8): 963-974. Aug. 1977. SFA 23(1)
[Niigata Senior High Sch., Sekuya, Niigata, 951 Japan] In order to determine the specific factor which provokes the seasonal changes in the thymic activities of gobies four selected species were examined histologically throughout their life-span. Peak thymic enlargement in all species examined is seen in May to July, whereas the breeding season of these species takes place in early spring or summer. The cyclic patterns in the thymic activities of gobiid fishes may coincide with the annual fluctuatuion in the duration of day light rather than with cyclic changes in breeding. The greatest relative growth of the thymus occurs in the larval or under-yearling gobies. After larval stage a gradual involution of the thymus occurs day by day. This change differs from that of adult fish which show cyclic variation. In /Chasmichthys gulosus/ and /Acanthogobius flavimanus/ the hyperplasia of the parenchyma and increase in the amount of connective tissue and epithelial cells take place in parallel with the enlargement of thymus. Hassall's corpuscles and their allied structures, and formation of follicles are demonstrated in the enlarged thymus.

78-000076 Trunov, I. A. NOTES ON THE ICHTHYOFAUNA OF THE SOUTH-EASTERN ATLANTIC. /HYPOCLYDONIA BELLA/ GOODE ET BEAN, 1895 AND /MACROPARALEPIS MACROGENEION/ POST, 1973. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 657-659. 1976. SFA 23(1)
[AtlantNIRO, Kaliningrad, USSR]

78-000077 Turner, B. J.; Liu, R. K. XANTHIC VARIANTS IN A NATURAL POPULATION OF THE SALT CREEK PUPFISH, /CYPRINODON SALINUS/. Southwest. Nat. 22 (4): 538-540. 15 Oct. 1977. SFA 23(1)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

PHYSIOLOGY

78-000078 Abramowitz, J.; Turner, W. A., Jr.; Chavin, W.; Taylor, J. D. TYROSINASE POSITIVE OCULOCUTANEOUS ALBINISM IN THE GOLDFISH, /CARASSIUS AURATUS/ L., AN ULTRASTRUCTURAL AND BIOCHEMICAL STUDY OF THE EYE. Cell Tissue Res. 182 (3): 409-419. 1977. SFA 23(1)
[Dr. J. D. Taylor: Dep. Biol., Wayne State Univ., Detroit, MI 48202]

78-000079 Al-Daham, N. K.; Bhatti, M. N. SALINITY TOLERANCE OF /GAMBUSIA AFFINIS/ (BAIRD & GIRARD) AND /HETEROPNEUSTES FOSSILIS/ (BLOCH). J. Fish Biol. 11 (4): 309-313. Oct. 1977. SFA 23(1)
[Dep. Fish., Coll. Agric., Univ. Basrah, Iraq] The present paper describes the results of a study on the salinity tolerance of two freshwater fishes, /Gambusia affinis/ (Baird & Girard) and /Heteropneustes fossilis/ (Bloch). The two species were treated with various concentrations of sea water and three most common salts found in the saline waters of Iraq, namely sodium chloride, calcium chloride and potassium chloride. The mortality rates following these treatments were recorded. Both species showed the highest degree of resistance for sea water and sodium chloride, and the lowest degree of tolerance to potassium chloride. /Gambusia affinis/ was more resistant to these

78-000079 CONTINUED
salts and sea water than /H. fossilis/.

78-000080 Ballintijn, C. M.; Beatty, D. D.; Saunders, R. L. EFFECTS OF PSEUDOBRANCHECTOMY ON VISUAL PIGMENT DENSITY AND OCULAR PO(2) IN ATLANTIC SALMON, /SALMO SALAR/. J. Fish. Res. Board Can. 34 (11): 2185-2192. Nov. 1977. In English with French summ. SFA 23(1)
[Zool. Lab., Rijksuniversteit Groningen, Kerklaan 30, Haren (Gr.), The Netherlands]

78-000081 Belaud, A.; Sebert, P.; Soulier, P.; Peyraud, C. RELATIVE ESTIMATION OF VENTILATORY FLOW RATE IN THE EEL (/ANGUILLA ANGUILLA/ L.). Rev. Can. Biol. 36 (2): 93-103. June 1977. In English with French summ. SFA 23(1)
[Lab. Physiol. Anim., 6 Ave. de Gorgeu, 29279, Brest, Cedex, France]

78-000082 Billard, R.; Dupont, J.; Barnabe, G. DIMINUTION DE LA MOTILITE ET DE LA DUREE DE CONSERVATION DU SPERME DE /DICENTRARCHUS LABRAX/ L. (POISSON, TELEOSTEEN) PENDANT LA PERIODE DE SPERMIATION. [FALL IN MOTILITY AND SURVIVAL TIME AT LOW TEMPERATURE OF SPERM OF /DICENTRARCHUS LABRAX/ L. (PISCES, TELEOSTEI) DURING THE SPAWNING SEASON.] Aquaculture 11 (4): 363-367. Aug. 1977. In French with English summ. SFA 23(1)
[Lab. Physiol. Poissons, I.N.R.A., 78350 Jouy-en-Josas, France] The quality of sperm from sea bass (/Dicentrarchus labrax/ L.) was evaluated at different times during the spawning season by measuring the duration and intensity of sperm motility following dilution. The survival of sperm stored at 4° C was similarly evaluated. Sperm diluted 100 times maintained their initial activity for 5 min at the beginning of the spawning season (17 December), 2 min on 13 January and 30 s at the end of the spawning season (18 February). Similarly, the survival time of spermatozoa stored at 4° C decreased from 70 h at the beginning, to barely 30 min in the middle and at the end of the spawning season. We conclude from these results that aging of spermatozoa occurs during the spawning season.

78-000083 Billard, R.; Richard, M.; Breton, B. STIMULATION OF GONADOTROPIN SECRETION AFTER CASTRATION IN RAINBOW TROUT. Gen. Comp. Endocrinol. 33 (1): 163-165. Sept. 1977. SFA 23(1)
[I.N.R.A., Lab. Physiol. Poissons, 78350 Jouy en Josas, France]

78-000084 Borjeson, H. EFFECTS OF HYPERCAPNIA ON THE BUFFER CAPACITY AND HAEMATOLOGICAL VALUES IN /SALMO SALAR/ (L.). J. Fish Biol. 11 (2): 133-142. Aug. 1977. SFA 23(1)
[Inst. zoophysiol., Box 560, S-751 22, Uppsala, Sweden] The effects of high environmental carbon dioxide tension (PCO(2)) on buffering status, pH, haematocrit, red blood cell (RBC) count, mean corpuscle volume (MCV), and chloride (Cl^-) distribution in the blood of young salmon were investigated after 30 min and 24 h. An increase in blood buffering capacity was observed after 24 h. As compared to the preacclimation situation, haematocrit, RBC, MCV and Cl^- content of the erythrocytes increased after 30 min but decreased if hypercapnia was sustained for 24 h. However the plasma bicarbonate ($HCO^-(3)$) content increased over the whole experimental period. Plasma Cl^- content was decreased after 24 h, but the ratio of Cl^- between erythrocytes and plasma increased at the onset of hypercapnia, then remained unchanged during the rest of the investigation period.

78-000085 Butler, P. J.; Taylor, E. W.; Short, S. THE EFFECT OF SECTIONING CRANIAL NERVES V, VII, IX AND X ON THE CARDIAC RESPONSE OF THE DOGFISH /SCYLIORHINUS CANICULA/ TO ENVIRONMENTAL HYPOXIA. J. Exp. Biol. 69: 233-245. Aug. 1977. SFA 23(1)
[Dep. Zool. Comp. Physiol., Univ. Birmingham, Birmingham B15 2TT, England]

78-000086 Campbell, C. M.; Idler, D. R. OOCYTE MATURATION AND OVULATION INDUCED IN HYPOPHYSECTOMIZED WINTER FLOUNDER (/PSEUDOPLEURONECTES AMERICANUS/) BY PREPARATIONS FROM PITUITARY GLANDS OF AMERICAN PLAICE (/HIPPOGLOSSOIDES PLATESSOIDES/). J. Fish. Res. Board Can. 34 (11): 2151-2155. Nov. 1977. In English with French summ. SFA 23(1)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF, Canada]

78-000087 Caulton, M. S.; Bursell, E. THE RELATIONSHIP BETWEEN CHANGES IN CONDITION AND BODY COMPOSITION IN YOUNG /TILAPIA RENDALLI/ BOULENGER. J. Fish Biol. 11 (2): 143-150. Aug. 1977. SFA 23(1)
[Rhodes Univ., Grahamstown, South Africa] Good correlations exist between condition and the amount of fat, protein and water present in young /Tilapia rendalli/, but extreme care must be exercised when determing the nature of the relationships. The use of percentages when expressing the amount of each component should be avoided because such analyses can lead to erroneous results. Similarly the often used fat-water relationship for predicting the fat content in fish should not be used as this also leads to erronecus results. The reasons for the poor relationships are discussed and methods for overcoming these problems are given.

78-000088 Clarke, W. C.; Farmer, S. W.; Hartwell, K. M. EFFECT OF TELEOST PITUITARY GROWTH HORMONE ON GROWTH OF /TILAPIA MOSSAMBICA/ AND ON GROWTH AND SEAWATER ADAPTATION OF SOCKEYE SALMON (/ONCORHYNCHUS NERKA/). Gen. Comp. Endocrinol. 33 (2): 174-178. Oct. 1977. SFA 23(1)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC, Canada] Purified /Tilapia/ growth hormone (GH), which has already been shown to have slight but significant activity in the rat tibia assay, was found to promote growth in two intact teleost species, /Tilapia mossambica/ and /Oncorhynchus nerka/ (sockeye salmon). /Tilipia/ GH and bovine GH were approximately equipotent in stimulating an increase in both length and weight of these fish. In salmon, ovine prolactin (PRI) stimulated growth with a much lower potency than /Tilapia/ GH, while /Tilapia/ PRL was inactive. Furthermore, bovine GH, /Tilaplia/ GH, and ovine PRL facilitated adaptation of the salmon to sea water, while /Tilapia/ PRL had no effect. These data, along with published results of teleost bioassays specific for /Tilapia/ PRL, demonstrate that teleosts can readily distinguish between /Tilapia/ GH and /Tilapia/ PRL. This separation contrasts with previously reported similarities between the two hormones with respect to amino acid composition, immunochemistry, and activity in the rat tibia assay.

78-000089 de Vlaming, V. L.; Shing, J. EFFECTS OF LONG-TERM EXPOSURE TO CONSTANT PHOTOPERIOD-TEMPERATURE REGIMES ON GONADAL ACTIVITY AND ENERGY RESERVES IN THE GOLDEN SHINER, /NOTEMIGONUS CRYSOLEUCAS/. Copeia 1977 (4): 774-777. 25 Nov. 1977. SFA 23(1)
[Dep. Biol., Marquette Univ., Milwaukee, WI 53233]

78-000090 de Vlaming, V. L.; Paquette, G. PHOTOPERIOD AND TEMPERATURE EFFECTS ON GONADAL REGRESSION IN THE GOLDEN SHINER, /NOTEMIGONUS CRYSOLEUCAS/. Copeia 1977 (4): 793-797. 25 Nov. 1977. SFA 23(1)
[Dep. Biol., Marquette Univ., Milwaukee, WI 53233]

78-000091 Disler, N. N.; Smernov, S. A. SENSORY ORGANS OF THE LATERAL-LINE CANAL SYSTEM IN TWO PERCIDS AND THEIR IMPORTANCE IN BEHAVIOR. J. Fish. Res. Board Can. 34 (10): 1492-1503. Oct. 1977. In English with French summ. SFA 23(1)
[A. N. Severtsov Inst. Evol. Anim. Morphol. Ecol., Acad. Sci., Moscow, USSR]

78-000092 Dizon, A. E. EFFECT OF DISSOLVED OXYGEN CONCENTRATION AND SALINITY ON SWIMMING SPEED OF TWO SPECIES OF TUNAS. NOAA Fish. Bull. 75 (3): 649-653. July 1977. SFA 23(1)
[NMFS, P.O. Box 3830, Honolulu, HI 96812]

78-000093 Ellis, A. E. THE LEUCOCYTES OF FISH: A REVIEW. J. Fish Biol. 11 (5): 453-491. Nov. 1977. SFA 23(1)
[Mar. Lab., Aberdeen, Scotland]

78-000094 Ethridge, L.; Benjamin, M. THE TIME-SEQUENCE OF RESPONSE OF THE PROLACTIN CELLS OF THE FRESHWATER TELEOST, /POECILIA RETICULATA/, TO AN ALTERED ENVIRONMENTAL SALINITY. Cell Tissue Res. 182 (3): 371-382. 1977. SFA 23(1)
[M. Benjamin: Dep. Anat., Univ. Coll., P.O. Box 78, Cardiff CF1 1XL, Wales]

78-000095 Fal'ge, R.; Shpannkhof, I. AMYLASE, ESTERASE AND PROTEASE ACTIVITY IN THE GUT CONTENTS OF THE RAINBOW TROUT /SALMO GAIRDNERI/ AFTER FEEDING. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 672-677. 1976. SFA 23(1)
[Biol. Sect., Rostok Univ., USSR]

78-000096 Fryer, J. N.; Peter, R. E. HYPOTHALAMIC CONTROL OF ACTH SECRETION IN GOLDFISH. I. CORTICOTROPHIN-RELEASING FACTOR ACTIVITY IN TELEOST BRAIN TISSUE EXTRACTS. Gen. Comp. Endocrinol. 33 (2): 196-201. Oct. 1977. SFA 23(1)
[Dep. Zool., Univ. Calif., Berkeley 94720]

78-000097 Fryer, J. N.; Peter, R. E. HYPOTHALAMIC CONTROL OF ACTH SECRETION IN GOLDFISH. III. HYPOTHALAMIC CORTISOL IMPLANT STUDIES. Gen. Comp. Endocrinol. 33 (2): 215-225. Oct. 1977. SFA 23(1)
[Dep. zool., Univ. Calif., Berkeley 94720]

78-000098 Fryer, J. N.; Peter, R. E. HYPOTHALAMIC CONTROL OF ACTH SECRETION IN GOLDFISH. II. HYPOTHALAMIC LESIONING STUDIES. Gen. Comp. Endocrinol. 33 (2): 202-214. Oct. 1977. SFA 23(1)
[Dep. Zool., Univ. Calif., Berkeley 94720]

78-000099 Gatesoupe, F. J.; Leger, C.; Boudon, M.; Metailler, R.; Luquet, P. ALIMENTATION LIPIDIQUE DU TURBOT (/SCOPHTHALMUS MAXIMUS/ L.). II. INFLUENCE DE LA SUPPLEMENTATION EN ESTERS METHYLIQUES DE L'ACIDE LINOLENIQUE ET DE LA COMPLEMENTATION EN ACIDES GRAS DE LA SERIE W 9 SUR LA CROISSANCE. [LIPID FEEDING OF TURBOT (/SCOPHTHALMUS MAXIMUS/ L.). II. INFLUENCE ON GROWTH OF SUPPLEMENTATION WITH METHYL ESTERS OF LINOLENIC ACID AND FATTY ACIDS OF THE W9 SERIES.] Ann. Hydrobiol. 8 (2): 247-254. 1977. In French with English summ. SFA 23(1)
[Lab. Nutr. Poissons, I.N.R.A., Cent. Natl. Rech. Zootech., 78350 Jouy-en-Josas, France] Study of fatty acid requirements in the Turbot was made by measuring the influence on growth of linolenic acid and long-chain fatty acids of the w3 series. The effects of supplementation with fatty acids of the w9 series were also examined. To that end, different oils or oil mixtures, with or without supplementation with methyl esters of linseed oil, were incorporated into the diet at a level of 10 p. 100. The results obtained confirm the necessity of incorporating long-chain fatty acids of the w3 series into the diet, but they also indicate the positive effect of supplementing the diets with methyle linolenate. These finding might be explained by one of the following two hypotheses: either the Turbot exhibits higher requirements for long-chain fatty acids of the w3 series than the Trout or its enzymatic capacities for elongation-desaturation are lower.

78-000100 Gesser, H. THE EFFECTS OF HYPOXIA AND REOXYGENATION ON FORCE DEVELOPMENT IN MYOCARDIA OF CARP AND RAINBOW TROUT: PROTECTIVE EFFECTS OF CO(2)/HCO(3) . J. Exp. Biol. 69: 199-206. Aug. 1977. SFA 23(1)
[Dep. Zoophysiol., Univ. Aarhus DK-8000 Aarhus C., Denmark]

78-000101 Gill, V. E.; Burford, G. D.; Lederis, K.; Zimmerman, E. A. AN IMMUNOCYTOCHEMICAL INVESTIGATION FOR ARGININE VASOTOCIN AND NEUROPHYSIN IN THE PITUITARY GLAND AND THE CAUDAL NEUROSECRETORY SYSTEM OF /CATOSTOMUS COMMERSONI/. Gen. Comp. Endocrinol. 32 (4): 505-511. Aug. 1977. SFA 23(1)
[K. Lederis: Fac. Med., Univ. Calgary, Calgary, AB T2N 1A4, Canada]

78-000102 Girard, J-P.; Payan, P. KINETIC ANALYSIS OF SODIUM AND CHLORIDE INFLUXES ACROSS THE GILLS OF THE TROUT IN FRESH WATER. J. Physiol. 237 (1): 195-209. Dec. 1977. SFA 23(1)
[Comm. Energie Atom., Dep. Biol., Stn. Zool., 06230 Villefranche-sur-Mer, France]

78-000103 Grau, E. G.; Stetson, M. H. THE EFFECTS OF PROLACTIN AND TSH ON THYROID FUNCTION IN /FUNDULUS HETEROCLITUS/. Gen. Comp. Endocrinol. 33 (3): 329-335. Nov. 1977. SFA 23(1)
[Physiol. Sect., Sch. Life Health Sci., Univ. Del., Newark 19711]

78-000104 Grau, E. G.; Stetson, M. H. PITUITARY AUTOTRANSPLANTS IN /FUNDULUS HETEROCLITUS/: EFFECT ON THYROID FUNCTION. Gen. Comp. Endocrinol. 32 (4): 427-431. Aug. 1977. SFA 23(1)
[Physiol. Sect., Sch. Life Health Sci., Univ. Del., Newark 19711]

78-000105 Hamor, T.; Garside, E. T. SIZE RELATIONS AND YOLK UTILIZATION IN EMBRYONATED OVA AND ALEVINS OF ATLANTIC SALMON /SALMO SALAR/ L. IN VARIOUS COMBINATIONS OF TEMPERATURE AND DISSOLVED OXYGEN. Can. J. Zool. 55 (11): 1892-1898. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

78-000106 Hobden, B. R.; Klaverkamp, J. F. A PHARMACOLOGICAL CHARACTERIZATION OF ACETYLCHOLINESTERASE FROM RAINBOW TROUT (/SALMO GAIRDNERI/) BRAIN. Comp. Biochem. Physiol. C Comp. Pharmacol. 57 (2): 131-133. 1977. SFA 23(1)
[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3t 2N6, Canada]

78-000107 Hokanson, K. E. F. TEMPERATURE REQUIREMENTS OF SOME PERCIDS AND ADAPTATIONS TO THE SEASONAL TEMPERATURE CYCLE. J. Fish. Res. Board Can. 34 (10): 1524-1550. Oct. 1977. In English with French summ. SFA 23(1)
[U.S. EPA, Environ. Res .Lab., Monticello, MN 55362]

78-000108 Holder, f.-C.; Guerne, J.-M. DOSAGE RADIO-IMMUNOLOGIQUE DE LA VASOTOCINE HYPOPHYSAIRE CHEZ /PHOXINUS IAEVIS/ AU COURS DE MODIFICATIONS EXPERIMENTALES DE L'EQUILIBRE OSMOTIQUE. [RADIO-IMMUNOLOGICAL DETERMINATION OF HYPOPHYSIAL VASOTOCIN BY /PHOXINUS LAEVIS/ SUBJECTED TO ENVIRONMENTAL SALINITY CHANGES.] C. R. Hebd. Seances Acad. Sci. Ser D Sci. Nat. 285 (8): 901-904. 10 Oct. 1977. In French with English summ. SFA 23(1)
[Lab. Physiol. Comp., B.P. 20 C.R.O., 67037 Strasbourg Cedex, France] Hypophysial vasotocin of /Phoxinus laevis/ is determined by radio-immuoassay. With different sea water dilutions it is shown that hypophysial vasotocin concentration varies with ambient salinity. This fact agrees with histolcgical pictures. Moreover, in comparison with the results of other authors, it is established that the hypophysial morphological modifications appeared only after the hormonal changes.

78-000109 Hurlburt, M. E. ROLE OF THE THYROID GLAND IN OVARIAN MATURATION OF THE GOLDFISH, /CARASSIUS AURATUS/ L. Can. J. Zool. 55 (11): 1906-1913. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-000110 Ingram, G. A.; Alexander, J. B. THE IMMUNE RESPONSE OF BROWN TROUT (/SALMO TRUTTA/ L.) TO INJECTION WITH SOLUBLE ANTIGENS. Acta Biol. Med. Ger. 35: 1561-1570. 1976. SFA 23(1)
[Dep. Biol., Gardner St. Annex, Univ. Salford, Salford, M6 6WZ, England]

78-000111 Ingram, G. A.; Alexander, J. B. SERUM PROTEIN CHANGES IN BROWN TROUT (/SALMO TRUTTA/ L.) AFTER SINGLE INJECTIONS OF SOLUBLE AND CELLULAR ANTIGENS. J. Fish Biol. 11 (3): 283-291. Sept. 1977. SFA 23(1)
[Dep. Biol., Univ. Salford, Salford M5 4WT, Lancashire, England] Brown trout sera were examined by cellulose acetate (CAE) and polyacrylamide electrophoresis (PAE) and the protein concentrations measured by the Lowry method, before and after stimulation with haemocyanin, horse serum, /Salmonella typhi/ 'H' and human group 'O' erythrocytes. Uninjected fish contained 5.11±0.71 g protein/100 ml. Protein concentration was unaffected by haemocyanin and horse serum but was significantly lowered by /S. typhi/ and human group 'O' erythrocytes. Male and female fish gave similar responses. Uninjected and injected fish showed 8 components on CAE and 16 on PAE. Significant differences were found between injected and uninjected control fish and between antigen stimulated and uninjected controls.

78-000112 Inui, Y.; Yokote, M. EFFECTS OF GLUCAGON ON AMINO ACID METABOLISM IN JAPANESE EELS, /ANGUILLA JAPONICA/. Gen. Comp. Endocrinol. 33 (2): 167-173. Oct. 1977. SFA 23(1)
[Freshwater Fish. Res. Lab., Hino-shi, Japan]

78-000113 Inui, Y.; Gorbman, A. SENSITIVITY OF PACIFIC HAGFISH, /EPTATRETUS STOUTI/, TO MAMMALIAN INSULIN. Gen. Comp. Endocrinol. 33(3): 423-427. Nov. 1977. SFA 23(1)
[Dep. Zool., Univ. Wash., Seattle 98195]

78-000114 Kallner, A. A STUDY OF THE CONVERSION OF CHOLESTEROL TO BILE ACIDS BY THE USE OF A FISTULATED BILE DUCT. J. Fish Biol. 11 (4): 343-347. Oct. 1977. SFA 23(1)
[Dep. Clin. Chem., Huddinge Hosp., S-141 86 Huddinge, Sweden] A method for the surgical preparation of a bile fistula in the sculpin /Myoxocephalus quadricornis/ is presented. This model was used in demonstrating the conversion of ^{14}C-cholesterol into bile acids. The main acid metabolite was cholic acid and the presence of dihydroxy bile acids was also demonstrated. The amount of labelled compounds which was recovered in the bile was small both in case of parenteral administration to fistulated sculpins and after peroral administration to intact animals. This may be attributable to slow metabolism at the low ambient temperature these animals require to survive.

78-000115 Kaushik, S.; Luquet, P. ENDOGENOUS NITROGEN LOSS FROM THE MUSCLE OF RAINBOW TROUT STARVED IN FRESH WATER AND SEA WATER. Ann. Hydrobiol. 8 (2): 129-134. 1977. In English with French summ. SFA 23(1)
[Lab. Nutr. Poissons, Cent. Natl. Rech. Zootech., I.N.R.A., 78350 Jouy-en-Josas, France] Rainbow trout kept in fresh water and adapted to sea water, were fasted for a period of two months. The consequent evolution of body weight changes and the composition of the muscle were observed. Trout adapted to total sea water appear to have a lower catabolic loss from the laterodorsal muscle during fasting (2-3,5 mgN/100 g/day) compared to those maintained in fresh water (4,6-7

78-000115 CONTINUED
mgN/100 g/day). The endogenous loss of nitrogen from muscle for energy purposes seems to be of the same magnitude in both groups of fish (17-22 mgN/kcal) over the whole period.

78-000116 Kaushik, S.; Luquet, P. STUDY OF FREE AMINO ACIDS IN RAINBOW TROUT IN RELATION TO SALINITY CHANGES. I. BLOOD FREE AMINO ACIDS DURING STARVATION. Ann. Hydrobiol. 8 (2): 135-144. 1977. In English with French summ. SFA 23(1)
[Lab. Nutr. Poissons, Cent. Natl. Rech. Zootech., I.N.R.A., 78350 Jouy-en-Josas, France] Rainbow trout kept in different salinities (sea water and fresh water) were subjected to a starvation period of two months. Body weight changes as well as the evolution in pattern of blood free amino acids were recorded at regular intervals. It is observed that trout adapted to sea water show a higher efficiency of protein conservation under a no-feed stress with a greater stability in its essential amino acid pattern in blood. Trout in sea water has a slower absorption rate of amino acids (12 hours after meal) in contrast to trout in fresh water (6 hours fast). Taurine appears to exert an influence on the maintenance of a stable free amino acid pool in trout under catabolic conditions of starvation.

78-000117 Kaushik, S.; Harache, Y.; Luquet, P. VARIATIONS IN THE TOTAL FREE AMINO ACIDS LEVEL IN RAINBOW TROUT MUSCLE AND BLOOD DURING ITS ADAPTATION TO SEA WATER. Ann. Hydrobiol. 8 (2): 145-151. 1977. In English with French summ. SFA 23(1)
[Lab. Nutr. Poissons, Cent. Natl. Rech. Zootech., I.N.R.A., 78350 Jouy-en-Josas, France] Yearling rainbow trout (70 g) grown in fresh water were gradually adapted to sea water (35 p. 1,000) over a period of 18 days during the late fall of 1974. Changes in the total free amino acid content of the latero-dorsal muscle and of the whole blood were observed at regular intervals during this period. The variations in the total free amino acids of the blood do not appear to be influenced by increasing salinity of the water whereas that of the muscle seem to be affected at salinities above 29 p. 1,000. This, in conjunction with the increase in mortality rate observed at these salinities suggests that the homoeostatic mechanisms of rainbow trout of this size are subjected to a stress beyond a salinity of 29 p. 1,000.

78-000118 Kayes, T. EFFECTS OF HYPOPHYSECTOMY, BEEF GROWTH HORMONE REPLACEMENT THERAPY, PITUITARY AUTOTRANSPLANTATION, AND ENVIRONMENTAL SALINITY ON GROWTH IN THE BLACK BULLHEAD (/ICTALURUS MELAS/). Gen. Comp. Endocrinol. 33 (3): 371-381. Nov. 1977. SFA 23(1)
[Univ. Wis., Aquacult. Lab., 6080 McKee Rd., Madison 53711]

78-000119 Kayes, T. EFFECTS OF TEMPERATURE ON HYPOPHYSEAL (GROWTH HORMONE) REGULATION OF LENGTH, WEIGHT, AND ALLOMETRIC GROWTH AND TOTAL LIPID AND WATER CONCENTRATIONS IN THE BLACK BULLHEAD (/ICTALURUS MELAS/). Gen. Comp. Endocrinol. 33 (3): 382-393. Nov. 1977. SFA 23(1)
[Univ. Wis., Aquacult. Lab., 6080 McKee Rd., Madison 53711]

78-000120 Kiceniuk, J. W.; Jones, D. R. THE OXYGEN TRANSPORT SYSTEM IN TROUT (/SALMO GAIRDNERI/) DURING SUSTAINED EXERCISE. J. Exp. Biol. 69: 247-260. Aug. 1977. SFA 23(1)
[Fish. Mar. Serv., Newfoundland Biol. Stn., 3 Water St., St. John's, NF A1C 1A1, Canada]

78-000121 Kime, D. E. MEASUREMENT OF 1ALPHA-HYDROXYCORTICOSTERONE AND OTHER CORTICOSTEROIDS IN ELASMOBRANCH PLASMA BY RADIOIMMUNOASSAY. Gen. Comp. Endocrinol. 33 (3): 344-351. Nov. 1977. SFA 23(1)
[Dep. Zool., The University, Sheffield S10 2TN, England]

78-000122 Klyashtorin, L. B. THE SENSITIVITY OF YOUNG STURGEONS TO OXYGEN DEFICIENCY. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 677-682. 1976. SFA 23(1)
[VNIRO, Moscow, USSR] The Russian and Siberian sturgeon, the sevryuga and the hybrid of the beluga and sterlet are characterized by similar indicators of sensitivity to oxygen deficiency in a temperature range of 5 to 26°. A tendency to a certain decrease in values of critical pO(2) were found in the order: sevryuga, Siberian sturgeon, Russian sturgeon, hybrid of the beluga and sterlet. As regards the values of critical pO(2), sturgeons slightly surpass such an oxyphilic species as the rainbow trout, and they considerably surpass the carp in respect of oxygen sensitivity. It may be assumed that other members of the sturgeon family have indicators of oxygen sensitivity similar to those of the species investigated.--Concl.

78-000123 Komourdjian, M. P.; Idler, D. R. HYPOPHYSECTOMY OF RAINBOW TROUT, /SALMO GAIRDNERI/, AND ITS EFFECT ON PLASMATIC SODIUM REGULATION. Gen. Comp. Endocrinol. 32 (4): 536-542. Aug. 1977. SFA 23(1)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

78-000124 Lapin, V. I. SOME FEATURES OF SEASONAL VARIATIONS IN PHYSIOLOGICAL AND BIOCHEMICAL INDICATORS OF DIFFERENT POPULATIONS OF THE FLOUNDER /PLATICHTHYS FLESUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 636-646. 1976. SFA 23(1)
[Dep. Ichthyol., Moscow Univ., Moscow, USSR] The nature of the seasonal variations in the total content of protein, the defatted non-protein residue, lipids and moisture in the muscles, liver and gonads of two forms of the Baltic flounder was investigated and the dynamics of these indicators compared with the variations observed in the White Sea and Black Sea subspecies of the flounder.

78-000125 Lewis, S. V.; Potter, I. C. OXYGEN CONSUMPTION DURING THE METAMORPHOSIS OF THE PARASITIC LAMPREY, /LAMPETRA FLUVIATILIS/ (L.) AND ITS NON-PARASITIC DERIVATIVE, /LAMPETRA PLANERI/ (BLOCH). J. Exp. Biol. 69: 187-198. Aug. 1977. SFA 23(1)
[Sch. Biol. Sci., Univ. Malaya, Pantai Valley, Kuala Lumpur 22-11, Malaysia]

78-000126 Li, H. W.; Brocksen, R. W. APPROACHES TO THE ANALYSIS OF ENERGETIC COSTS OF INTRASPECIFIC COMPETITION FOR SPACE BY RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish Biol. 11 (4): 329-341. Oct. 1977. SFA 23(1)

[Div. Wildl. Fish. Biol., Univ. Calif., Davis 95616] Two approaches of estimating energy expended by rainbow trout (/Salmo gairdneri/) on density-dependent activities were tested. Metabolic rates were obtained from growth experiments in laboratory systems. Increases in metabolic rates at higher population densities were attributed to three factors: (1) starvation, (2) increased levels of excercise by subdominant fish were forced to maintain stations in fast water due to saturation of territories of more dominant trout, (3) higher planes of excitation. It was observed that variance of energetic factors of routine metabolism, growth rate, consumption rate, and growth efficiency tended to increase with density. These responses seem to be a good indication of intraspecific competition. Little correlation was observed between density and average daily ration, or density and aggressive behaviour. Dominant trout, as a group grew faster, grew more efficiently, and contained greater lipid content than the rest of the population at each density. However, strictly defined, energetic advantages were not conferred on a 'peck-right' basis. At higher densities, dominance conferred less benefits than was observed at lower population levels. Space limitation /per se/ was not an influential factor affecting growth rates. Methods used to estimate density-dependent energy costs are evaluated. Both methods give nearly identical estimates.

78-000127 Luk'yanenko, V. I.; Geraskin, P. P.; Surial', A. I. FRACTIONAL COMPOSITION OF HEMOGLOBIN OF THE BLOOD OF ANADROMOUS AND FRESHWATER SPECIES OF STURGEON FISHES. Sov. J. Ecol. (Engl. Transl. Ekologiya) 7 (6): 541-546. Nov.-Dec. 1977. SFA 23(1)

78-000128 Markofsky, J.; Matias, J. R. THE EFFECTS OF TEMPERATURE AND SEASON OF COLLECTION ON THE ONSET AND DURATION OF DIAPAUSE IN EMBRYOS OF THE ANNUAL FISH /NOTHOBRANCHIUS GUENTHERI/. J. Exp. Zool. 202 (1): 49-56. Oct. 1977. SFA 23(1)

[Orentreich Found. Adv. Sci., Inc., 909 Fifth Ave., New York, NY 10021] Annual fish are found in temporary bodies of water in habitats of alternating rainy and dry seasons. The populations survive the dry seasons in the form of embryos encased in the bottom mud. Several genera of annual fish have been reported to exhibit diapause (developmental arrest) at three specific stages of development and it has been proposed that through this adaptation the populations are able to survive the variable durations of the dry seasons. The effects of incubation and spawning temperatures, and season of collection on the onset and duration of diapause in laboratory populations of the annual fish, /Nothobranchius guentheri/, were studied. At low incubation and spawning temperatures there was a prolongation of Diapause I and Diapause II. In addition, fish spawned at 25°C during the short days of winter produced embryos that entered a prolonged duration of Diapause II, whereas embryos produced during the long days of summer bypassed Diapause II.

78-000129 McDonald, D. G.; McMahon, B. R. RESPIRATORY DEVELOPMENT IN ARCTIC CHAR /SALVELINUS ALPINUS/ UNDER CONDITIONS OF NORMOXIA AND CHRONIC HYPOXIA. Can. J. Zool. 55 (9): 1461-1467. Sept. 1977. SFA 23(1)

[Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada] Changes in surface morphology of the Gills, ventilatien rate, and heart rate were examined in Arctic char larvae exposed to normoxia (/p/O(2) = 121 ± 6(SE) mmHg) or chronic hypoxia (/p/O(2) = 33 ± 3.5mmHg) for 47 days after hatching. A modified weighted-average technique was developed to measure aspects of gill morphology. Early development of the gills was characterized by rapid increases in filament size and number, and the emergence and proliferation of secondary lamellae. Variations in the dimensions of the gills, as noted in adult fish, were particularly evident in the larval fish. Hypoxia caused increases in both ventilation rate and heart rate. Prolonged exposure led to a retardation of gill growth, particularly the proliferation of secondary lamellae. However, growth of individual lamellae was stimulated between 38 and 47 days.

78-000130 McLeay, D. J.; Gordon, M. R. LEUCOCRIT: A SIMPLE HEMATOLOGICAL TECHNIQUE FOR MEASURING ACUTE STRESS IN SALMONID FISH, INCLUDING STRESSFUL CONCENTRATIONS OF PULPMILL EFFLUENT. J. Fish. Res. Board Can. 34 (11): 2164-2175. Nov. 1977. In English with French summ. SFA 23(1)

Div. Appl. Res., B.C. Research, Vancouver, BC V6S 2L2, Canada]

78-000131 Mittal, A. K.; Agarwal, S. K. HISTOCHEMISTRY OF THE UNICELLULAR GLANDS IN RELATION TO THEIR PHYSIOLOGICAL SIGNIFICANCE IN THE EPIDERMIS OF /MONOPTERUS CUCHIA/ (SYNBRANCHIFORMES, PISCES). J. Zool. (Lond.) 182 (4): 429-439. Aug. 1977. SFA 23(1)

[Zool. Dep., Univ. Coll. London, Gower St., London, England]

78-000132 Mugiya, Y. EFFECT OF ACETAZOLAMIDE ON THE OTOLITH GROWTH OF GOLDFISH. Bull. Jpn. Soc. Sci. Fish. 43 (9): 1053-1058. Sept. 1977. SFA 23(1)

[Fac. Fish., Hokkaido Univ., Hakodate, Hakkaido, 040, Japan]

78-000133 Murphy, P.; Houston, A. H. TEMPERATURE, PHOTOPERIOD, AND WATER-ELECTROLYTE BALANCE IN RAINBOW TROUT, /SALMO GAIRDNERI/. Can. J. Zool. 55 (9): 1377-1388. Sept. 1977. SFA 23(1)

[A. H. Houston: Dep. Biol. Sci., Brock Univ., St. Catharines, ON L2S 3A1, Canada] The influence of temperature and photoperiod upon water-electrolyte balance was considered in animals acclimated to four combinations of two temperature (2, 18°C) and photoperiod (18 h light--6 h dark, 6h light--18 h dark) regimes through evaluation of Na, K, Ca, Mg, and Cl levels in plasma, skeletal, and cardiac muscle and liver. Water content and distribution and approximate cellular ion levels were estimated for skeletal muscle and liver. Evidence of significant influence upon water balance was obtained in one-half of the analyses performed, with effects being particularly pronounced in cold-acclimated, 'winter'-photoperiod specimens. Temperature effects were observed in two-thirds of the comparisons made with respect to electrolyte levels. These were not biased in relation to photoperiod. Most significant photoperiod-correlated variations in electrolyte levels (over one-half of the total considered) were observed at low temperature. These observations are discussed in relation to compensation of rainbow trout for temperature perturbation of the osmoregulatory and ionoregulatory systems, and the possible basis of photoperiodic influence upon these responses.

78-000134 Mustafa, S. INFLUENCE OF MATURATION ON THE CONCENTRATIONS OF RNA AND DNA IN THE FLESH OF THE CATFISH /CLARIAS BATRACHUS/. Trans. Am. Fish. Soc. 106 (5): 449-451. Sept. 1977. SFA 23(1)
[Sect. Ichthyol. Fish., Dep. Zool., Aligarh Muslim Univ., Aligarh 202 001, India]

78-000135 Nash, C. E.; Kuo, C-M.; Madden, W. D.; Paulsen, C. L. SWIM BLADDER INFLATION AND SURVIVAL OF /MUGIL CEPHALUS/ TO 50 DAYS. Aquaculture 12 (1): 89-94. Sept. 1977. SFA 23(1)
[Oceanic Inst., Waimanalo, HI 96765] Excessive inflation of the swim bladder causes immobility and mortality of 12-day old larvae of /Mugil cephalus/ and other marine fish. Increased aeration or mechanical agitation of the water in rearing tanks maintained the larvae below the water surface, and the swim bladder formed and functioned normally. Survival was dramatically increased. Two experimental production tanks, stocked initially with 15,000 and 20,000 larvae, at a density of 5.25 and 7.0/l, respectively, yielded 33.5 percent and 16.9 percent juveniles on day 50. Only an outbreak of ciliated parasites prevented both tanks from having survival figures of over 30 percent.

78-000136 Owen, J. M.; Middleton, C. FATTY ACIDS OF THE LIPIDS OF CULTURED HERRING. Aquaculture 11 (4): 369-372. Aug. 1977. SFA 23(1)
[Inst. Mar. Biochem., Nat. Environ. Res. Council, St. Fittick's Rd., Aberdeen, Scotland] The composition of fatty acids was determined in neutral lipids and phospholipids from cultured herring reared on a diet based on squid muscle. The phospholipids retained the fatty acid pattern characteristic of marine fish. In contrast, the fatty acids of neutral lipids tended to reflect the fatty acid spectrum in the diet, and were very different from the characteristic pattern of herring oils. It was concluded that the cultured herring had little ability to modify dietary fatty acids and that the enzymes of phospholipid metabolism possess considerable specificity for certain fatty acids.

78-000137 Pang, P. K.-T. OSMOREGULATORY FUNCTIONS OF NEUROHYPOPHYSIAL HORMONES IN FISHES AND AMPHIBIANS. Am. Zool. 17 (4): 739-749. 1977. SFA 23(1)
[Dep. Biol., Brooklyn Coll. City Univ. N.Y., Brooklyn 11210]

78-000138 Penczak, T.; Molinski, M.; Kusto, E.; Ichniowska, B.; Zalewski, M. THE ECOLOGY OF ROACH, /RUTILUS RUTILUS/ (L.), IN THE BARBEL REGION OF THE POLLUTED PILICA RIVER. III. LIPIDS, PROTEIN, TOTAL NITROGEN AND CALORICITY. Ekol. Pol. 25 (1): 75-88. 1977. In English with Polish summ. SFA 23(1)
[Dep. Coop. Anat. Anim. Ecol., Inst. Environ. Biol., Univ. Lodz, Poland] Of the factors examined (sex, age, increase of sewage concentration, seasons of the year) only the seasons of the year seem to affect significantly from the statistical point of view the level of lipids and body caloricity which is directly related to the trophic conditions. The differences in the amount of protein can be only explained by individual variability. Statistically significant correlations have been observed between the body weight and weight of lipids and between the body hydration and percentage of lipids.

78-000139 Percy, L. R.; Potter, I. C. CHANGES IN HAEMOPOIETIC SITES DURING THE METAMORPHOSIS OF THE LAMPREYS /LAMPETRA FLUVIATILIS/ AND /LAMPETRA PLANERI/. J. Zool. (Lond.) 183 (1): 111-123. Sept. 1977. SFA 23(1)
[Dep. Zool., Univ. Bath, Claverton Down, Bath, England]

78-000140 Phromsuthirak, P. ELECTRON MICROSCOPY OF WOUND HEALING IN THE SKIN OF /GASTEROSTEUS ACULEATUS/. J. Fish Biol. 11 (2): 193-206. Aug. 1977. SFA 23(1)
[Fac. Fish., Kasetsart Univ., Bangkok 9, Thailand] The process of healing of a small surgical incision in the skin of /Gasterosteus aculeatus/ has been studied by electron microscopy. The wounds were made in the mid-ventral line where no muscle intervenes between the skin and the peritoneum. The epidermis moved in through the incision and spread outwards beneath the dermis; the migrating epithelial cells were shown to be phagocytic. The wound was closed when cells at the surface of the epidermis met across the gap, forming a plug of epidermal tissue which was then invaded by dermal tissue from either side. Formation of new basement membrane apparently depended on the interaction of epidermal and dermal components. Leucocyte types were identified by electron microscopy; acid phosphatase tests were positive in macrophages and in neutrophil granulocytes, negative in lymphocytes and in eosinophil granulocytes. These four types of leucocyte are present in normal skin; after wounding, more migrated into the epidermis from the blood. The number of neutrophils in the epidermis reached a peak 24 h after wounding and declined during the second day. The number of macrophages rose to a peak by the third day and returned to normal by day 8. The numbers of eosinophil granulocytes and of lymphocytes showed little change. Neutrophil granulocytes were shown to be phagocytic, although not to the same extent as the macrophages.

78-000141 Reischl, E. OXYGEN EQUILIBRIA OF THE HEMOGLOBINS FROM THE FRESHWATER CATFISH /PIMELODUS MACULATUS/ (LACEPEDE, 1803). Comp. Biochem. Physiol. A Comp. Physiol. 58 (2): 217-221. 1977. SFA 23(1)
[Dep. Fisiol. Farmacol. Biofis., UFRGS, Cx. Postal 1953, Porto Alegre, RS-Brazil]

78-000142 Riehl, R. HISTO- UND ULTRAHISTOCHEMISCHE UNTERSUCHUNGEN AN DEN OOCYTEN VON /NOEMACHEILUS BARBATULUS/ (L.) UND GOBIO GOBIO/ (L.) (PISCES, TELEOSTEI). [HISTOCHEMICAL AND ULTRAHISTOCHEMICAL INVESTIGATIONS OF THE OOCYTES OF /NOEMACHEILUS BARBATULUS/ (L.) AND /GOBIO GOBIO/ (L.) (PISCES, TELEOSTEI).] Zool. Anz. 198 (5/6): 328-354. 1977. In German with English summ. SFA 23(1)
[Inst. Allg. Spez. Zool., Univ. Giessen, West Germany]

78-000143 Riehl, R. LICHT- UND ELEKTRONENMIKROSKOPISCHE UNTERSUCHUNGEN ZU BAU UND ENTWICKLUNG DER MIKROPYLEN VON /NOEMACHEILUS BARBATULUS/ (L.) UND /GOBIO GOBIO/ (L.) (PISCES, TELEOSTEI). [LIGHT- AND ELECTRONMICROSCOPICAL INVESTIGATIONS ABOUT STRUCUTRE AND DEVELOPMENT OF THE MICROPYLES OF /NOEMACHEILUS BARBATULUS/ AND /GOBIO GOBIO/ (PISCES, TELEOSTEI).] Zool. Anz. 198 (5/6): 313-327. 1977. In German with English summ. SFA 23(1)
[Inst. Allg. Spez. Zool., Univ. Giessen, West Germany]

78-000144 Rizzotti, M.; Comparini, A.; Rodino, E. THE HEMOGLOBINS OF /ANGUILLA ANGUILLA/ (L.) ONTOGENETIC VARATIONS. Comp. Biochem. Physiol. A Comp. Physiol. 58 (2): 173-176. 1977. SFA 23(1)
[Inst. Anim. Biol., Univ. Padua, Padua, Italy]

78-000145 Sangalang, G. B.; Freeman, H. C. A NEW SENSITIVE AND PRECISE METHOD FOR DETERMINING TESTOSTERONE AND 11-KETOTESTOSTERONE IN FISH PLASMA BY RADIOIMMUNOASSAY. Gen. Comp. Endocrinol. 32 (4): 432-439. Aug. 1977. Fish. Mar. Serv., Halifax Lab., Halifax, NS B3J 2R3, Canada]

78-000146 Sauerbier, I.; Meyer, W. CIRCADIAN RHYTHMS IN CATECHOLAMINE CONCENTRATIONS IN ORGANS OF THE COMMON GOLDFISH (/CARASSIUS AURATUS/ L.). Comp. Biochem. Physiol. C Comp. Pharmacol. 57 (2): 117-120. 1977. SFA 23(1)
[Dep. Anat. I, Med. Sch. Hannover, Karl-Weichert-Allee 9 D-3000 Hannover 61, West Germany]

78-000147 Shefner, J. M.; Levine, M. W. INTERACTIONS BETWEEN ROD AND CONE SYSTEMS IN THE GOLDFISH RETINA. Science 198 (4318): 750-753. 18 Nov. 1977. SFA 23(1)
[Dep. Psychol., Univ. Ill. at Chicago Circle, Chicago 60680] Signals from both the rod and the cone receptor systems converge upon the same retinal ganglion cell, but only one or the other of these systems appears to be effective at any particular level of adaptation. In this report we provide evidence that the change from one receptor system to the other is not simply due to the two systems having nonoverlapping dynamic ranges; rather, there is a distance-dependent interaction between the two systems.

78-000148 Smirnova, L. I. BILE COLOR INDEX AS AN INDICATOR OF THE PHYSIOLOGICAL CONDITION OF FISH. Sov. J. Ecol. (Engl. Transl. Ekologiya) 7 (6): 562-564. Nov.-Dec. 1977. SFA 23(1)

78-000149 Smith, E. A. H.; Mayfield, C. I.; Wong, P. T. S. COLONIZATION AND DECOMPOSTION OF FISH BONE MATERIAL IN NATURAL AND SYNTHETIC AQUEOUS SOLUTIONS. J. Fish. Res. Board Can. 34 (11): 2176-2184. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

78-000150 Smith, M. A. K.; Thorpe, A. ENDOCRINE EFFECTS ON NITROGEN EXCRETION IN THE EURYHALINE TELEOST, /SALMO GAIRDNERII/. Gen. Comp. Endocrinol. 32 (4): 400-406. Aug. 1977. SFA 23(1)
[Mar. Biol. Lab., Woods Hole, MA 02543]

78-000151 Sobhana, B.; Nair, N. B. OOGENESIS IN THE CLIVE CARP, /PUNTIUS SARANA SUBNASUTUS/. Zool. Anz. 198 (5/6): 373-379. 1977. SFA 23(1)
[Dep. Aquatic Biol. Fish., Univ. Kerala, India]

78-000152 Spieler, R. E.; Noeske, T. A.; DeVlaming, V.; Meier, A. H. EFFECTS OF THERMOCYCLES ON BODY WEIGHT GAIN AND GONADAL GROWTH IN THE GOLDFISH, /CARASSIUS AURATUS/. Trans. Am. Fish. Soc. 106 (5): 440-444. Sept. 1977. SFA 23(1)
[Vert. Div., Milwaukee Pub. Mus., 800 W. Wells St., Milwaukee, WI 53233]

78-000153 Spoor, W. A. OXYGEN REQUIREMENTS OF EMBRYOS AND LARVAE OF THE LARGEMOUTH BASS, /MICROPTERUS SALMOIDES/ (LACEPEDE). J. Fish Biol. 11 (2): 77-86. Aug. 1977. SFA 23(1)
[U.S. EPA, Environ. Res. Lab., 6201 Congdon Blvd. E., Duluth, MN 55804] Starting with the second day after fertilization, largemouth bass embryos and larvae became increasely sensitive to oxygen deficiency until the sixth day of life. On this day few survived exposure to 1 mg O(2)/l for 3 h at 20°C; many were damaged at 2 mg/l, but not at 2.5. Death was by asphyxiation or by starvation resulting from an apparent inability to close the lower jaw. On the seventh day the larvae became more resistant again, possibly because opercular movement began on that day. At 25°C the effects of reduced oxygen concentration were intensified, and even a concentration of 2.5 mg/l became lethal in 3 h. At 3 mg O(2)/l and 20° the normally quiescent yolk-sac larvae became very active and swam vertically to at least 5 or 6 cm above the substrate; 4 and 5 mg/l had this effect at 23-24°. This behaviour could result in losses by predation and displacement from the nest.

78-000154 Sumner, J. L.; Davis, S. R. LIPID AND AMINO-ACID COMPOSITION OF WHITEBAIT. N. Z. J. Mar. Freshwater Res. 11 (1): 169-172. Mar. 1977. SFA 23(1)
[Food Technol. Dep., Ege Univ., Bornova, Turkey] The amino-acid compositions of juvenile /Galaxias maculatus/ (Jenyns) ('white-bait'), eel, and fishmeal were essentially similar, having relatively large quantities of glutamic and aspartic acids and low quantities of cystine and histidine. The major fatty acids were 22:6, 16:0, 20:5, 18:1, 18:0, and 16:1, a profile which was indicative of a 'marine' lipid.

78-000155 Warner, M. C.; Williams, R. W. COMPARISON BETWEEN SERUM VALUES OF POND AND INTENSIVE RACEWAY CULTURED CHANNEL CATFISH /ICTALURUS PUNCTATUS/ (/RAFINESQUE/). J. Fish Biol. 11 (5): 385-391. Nov. 1977. SFA 23(1)
[U.S. Army Med. Bioeng. Res. Dev. Lab., Fort Detrick, Frederick, MD 21701] Blood serum components in channel catfish (/Ictalurus punctatus/) were compared between raceway (with low dissolved oxygen) and pond populations. Normal limits were defined for the pond populations, for each of 18 variables, as ± two standard deviations. Carbon dioxide, blood urea nitrogen, total protein, uric acid, creatinine, sodium, and total bilirubin were all lower in fish raised in raceways. Carbon dioxide and sodium had the greatest reductions; all reductions were statistically significant. Alkaline phosphatase, inorganic phosphorus, calcium, cholesterol, and glucose values were higher in raceway fish, but only alkaline phosphatase and glucose were significantly higher.

78-000156 Watanabe, T.; Takeuchi, T.; Matsui, M.; Ogino, C.; Kawabata, T. EFFECT OF ALPHA-TOCOPHEROL DEFICIENCY ON CARP--VII. THE RELATIONSHIP BETWEEN DIETARY LEVELS OF LINOLEATE AND ALPHA-TOCOPHEROL REQUIREMENT. Bull. Jpn. Soc. Sci. Fish. 43 (8): 935-946. Aug. 1977. SFA 23(1)

[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo, Japan] Feeding experiments were conducted to investigate the relationship between the requirement for tocopherol and dietary linoleate levels in carp. The results obtained in the feeding experiments showed that the elevated dietary linoleate levels increase the tocopherol requirement of carp, judging from the appearance of apparant muscular dystrophy. The fish receiving the diet with alpha-tocopherol content less than 10 mg per 100 g diet at the 5 percent linoleate level showed apparent muscular dystrophy and gained less body weight that those receiving diets enriched with the vitamin at levels exceeding 30 mg per 100 g diet. The weight gain of the carp receiving from 10-15 percent linoleate at a fixed level of 10 mg alpha-tocopherol was low and 35-40 percent of the fish exhibited apparent muscular dystrophy. The fat-free and alpha-tocopherol deficient diets resulted in decreases in 18:2omega6, 20:4omega6 and 22:5omega6, the former diet also result in a marked increase of 16:1, 18:1 and 23:3omega9. Linoleic acid supplements gave increases in 18:2omega6, 20:4omega6 and 22:5omega6 and decreases in 16:1, 18:1 and 20:3omega9, while there were no marked changes in fatty acid distribution attributable to the presence of increasing levels of tocopherol in the diet.

78-000157 Woiwode, J. G. SEX REVERSAL OF /TILAPIA ZILLII/ BY INGESTION OF METHYLTERTOSTERONE. Philipp. Bur. Fish. Aquatic Resour. Tech. Pap. Ser. 1 (3): 1-5. May 1977. SFA 23(1)

78-000158 Wood, C. M.; McMahon, B. R.; McDonald, D. G. AN ANALYSIS OF CHANGES IN BLOOD PH FOLLOWING EXHAUSTING ACTIVITY IN THE STARRY FLOUNDER, /PLATICHTHYS STELLATUS/. J. Exp. Biol. 69: 173-185. Aug. 1977. SFA 23(1)

[Dep. Biol., McMaster Univ., 1280 Main St. West, Hamilton, ON L8S 4K1, Canada] Exhausting activity results in a marked and immediate drop in blood pH which gradually returns to normal over the following 6 h. The acidosis is caused largely by elevated /P/(CO(2)) levels, which vary inversely with pH. Blood lactate concentration increases slowly, reaching a maximum at 2-4 h post-exercise, and contributes significantly to the acidosis only late in the recovery period. The slow time course of lactic acid release into the blood permits temporal separation of the peak metabolic acidosis from the peak respiratory acidosis. Evidence is presented that a metabolic acid other than lactic also makes a modest contribution to the pH depression during the recovery period.

78-000159 Wright, G. M.; Youson, J. H. SERUM THYROXINE CONCENTRATIONS IN LARVAL AND METAMORPHOSING ANADROMOUS SEA LAMPREY, /PETROMYZON MARINUS/ L. J. Exp. Zool. 202 (1): 27-32. Oct. 1977. SFA 23(1)

[Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

78-000160 Yadav, M.; Ooi, H. S. D. EFFECT OF PHOTOPERIOD ON THE INCORPORATION OF ^{3}H-THYMIDINE INTO THE GONADS OF /CARASSIUS AURATUS/. J. Fish Biol. 11 (5): 409-416. Nov. 1977. SFA 23(1)
[Dep. Genet. Cell. Biol., Univ. Malaya, Kuala Lumpur, Malaysia]

78-000161 Yaron, Z.; Terkatin-Shimony, A.; Shaham, Y.; Salzer, H. OCCURRENCE AND BIOLOGICAL ACTIVITY OF ESTRADIOL-17BETA IN THE INTACT AND OVARIECTOMIZED /TILAPIA AUREA/ (CICHLIDAE, TELEOSTEI/). Gen. Comp. Endocrinol. 33 (1): 45-52. Sept. 1977. SFA 23(1)
[Dep. Zool., Geo. S. Wise Cent. Life Sci., Tel Aviv Univ., Tel Aviv, Israel]

78-000162 Zelnik, P. R.; Hornsey, D. J.; Hardisty, M. W. INSULIN AND GLUCAGON-LIKE IMMUNOREACTIVITY IN THE RIVER LAMPREY (/LAMPETRA FLUVIATILIS/). Gen. Comp. Endocrinol. 33 (1): 53-60. Sept. 1977. SFA 23(1)
[Sch. Biol. Sci., Univ. Bath, Claverton Down, Bath, BA2 7AY, England]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

78-000163 Cross, T. F.; Payne, R. H. NADP-ISOCITRATE DEHYDROGENASE POLYMORPHISM IN THE ATLANTIC SALMON /SALMO SALAR/. J. Fish Biol. 11 (5): 493-496. Nov. 1977. SFA 23(1)
[Fish. Mar. Serv., Newfoundland Biol. Stn., St. John's, NF, Canada] Electrophoretic variation of Atlantic salmon NADP-isocitrate dehydrogenase in liver extracts of material from Ireland is interpreted in terms of two loci, IDH-A and IDH-B, coding for cytoplasmically-located isozymes. The IDH-A locus is polymorphic with $qIDH\text{-}A^{1} = 0.18$ and $qIDH\text{-}A^{2} = 0.82$. This polymorphism is of potential value for investigating the population genetics of the two races of Atlantic salmon in Ireland. An additional, monomorphic band which appears in heart extracts may be a mitochondrial enzyme coded by a third locus.

78-000164 Ferris, S. D.; Whitt, G. S. THE EVOLUTION OF DUPLICATE GENE EXPRESSION IN THE CARP (/CYPRINUS CARPIO/). Experientia (Basel) 33 (10): 1299-1301. 15 Oct. 1977. SFA 23(1)
[G. S. Whitt: Dep. Genet. Dev., 515 Morrill Hall, Univ., Ill., Urbana 61801] The carp, /Cyprinus carpio/ (Teleostomi), is a tetraploid species which currently expresses 52 percent of its duplicate enzyme loci. This level of duplicate gene expression in this cyprinid species is comparable to those observed in tetraploid Catostomidae, but higher than those in tetraploid Cobitidae.

78-000165 Gjedrem, T.; Eggum, A.; Refstie, T. CHROMOSOMES OF SOME SALMONIDS AND SALMONID HYBRIDS. Aquaculture 11 (4): 335-348. Aug. 1977. SFA 23(1)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, As-NIH, As, Norway] In connection with a cross-breeding programme for studying production traits in different salmonidae species and their crosses, chromosome number was studied by means of leukocyte culture. The number of chromosomes varied considerably within each species and within each group of hybrids. The chromosome number of hybrids was usually close to the average number of the parental species.

78-000166 Gorman, G. C.; Kim, Y. J. GENOTYPIC EVOLUTION IN THE FACE OF PHENOTYPIC CONSERVATIVENESS: /ABUDEFDUF/ (POMACENTRIDAE) FROM THE ATLANTIC AND PACIFIC SIDES OF PANAMA. Copeia 1977 (4): 694-697. 25 Nov. 1977. SFA 23(1)
[Biol. Dep., Univ. Calif., Los Angeles 90024]
/Abudefduf saxatilis/ and /A. troschelii/ from the Atlantic and Pacific sides of Panama are geminate species that show little morphological differentiation. Absolute differences occur at seven of 28 enzyme loci. The "clock hypothesis" suggests a divergence time of five million years. Genotypic evolution of enzyme loci appears to be a function of time and uncorrelated with the rate of morphological Evolution.

78-000167 Kanep, S. V. ANALYSIS OF VARIABILITY OF MORPHOLOGICAL, MERISTIC AND INTERNAL CHARACTERS OF WHITEFISHES (FAMILY COREGONIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 552-565. 1976. SFA 23(1)
[SibrybNIIproyekt, Tyumen', USSR] The variability of the Morphological, meristic and internal characters of different populations of whitefishes was studied. Methods of correlation and regression-allometric analysis have been used. The direction of the changes in the set of characters of the mouth and gill apparatus, trunk characters, correlation of frequency series of scales in the lateral line and number of rays in paired and unpaired fins is examined. Groups of characters above generic, specific and population rank are described.

78-000168 Kincaid, H. L. ROTATIONAL LINE CROSSING: AN APPROACH TO THE REDUCTION OF INBREEDING ACCUMULATION IN TROUT BROOD STOCKS. Prog. Fish-Cult. 39 (4): 179-181. Oct. 1977. SFA 23(1)
[U.S. FWS, Fish Genet. Lab., Beulah, WY 82712]

78-000169 Ross, M. R.; Cavender, T. M. FIRST REPORT OF THE NATURAL CYPRINID HYBRID, /NOTROPIS CORNUTUS/ X /RHINICHTHYS CATARACTAE/, FROM OHIO. Copeia 1977 (4): 777-780. 25 Nov. 1977. SFA 23(1)
[Dep. Forestry Wildl. Manage., Univ., Mass., Amherst 01002]

78-000170 Serns, S. L.; McKnight, T. C. THE OCCURRENCE OF NORTHERN PIKE X GRASS PICKEREL HYBRIDS AND AN EXCEPTIONALLY LARGE GRASS PICKEREL IN A NORTHERN WISCONSIN STREAM. Copeia 1977 (4): 780-781. 25 Nov. 1977. SFA 23(1)
[Wis. Dep. Nat. Resour., Box 440, Woodruff 54568]

78-000171 Sutterlin, A. M.; MacFarlane, L. R.; Harmon, P. GROWTH AND SALINITY TOLERANCE IN HYBRIDS WITHIN /SALMO/ SP. AND /SALVELINUS/ SP. Aquaculture 12 (1): 41-52. Sept. 1977. SFA 23(1)
[Inst. Biol. Geol., Box 790, Univ. Tromso, N-9001 Tromso, Norway] Attempts were made to complete all possible interspecific hybrid crosses between Atlantic salmon (/Salmo salar/), rainbow trout (/Salmo gairdneri/), brook trout (/Salvelinus fontinalis/), lake trout (/Salvelinus namaycush/), and Arctic char (/Salvelinus alpinus/). Survival was appreciable only in (giving female first) lake X brook, salmon X char, brook X char and char X brook hybrids. Growth rates over a weight increment of 0-30 g averaged 2.14 percent wet weight/day for all species and hybrids (14.5-17.0° C-excess rations). The highest growth rate, 2.74 percent, was obtained with the brook (female) X char (male) hybrid and the lowest, 1.63 percent, in lake

78-000171 CONTINUED
trout. Salmon (female) X char (male) hybrids grew faster than salmon; brook trout (female) X char (male) hybrids grew faster than brook trout. /Salmo/ species grew no faster than /Salvelinus/ species but became silvery and had greater salinity tolerance at a smaller size and earlier age. Intergeneric hybrids between female /Salmo/ spp. and male /Salvelinus/ spp. more closely resembled the female parent in processes related to smoltification (silvering and salinity tolerance).

BEHAVIOR

78-000172 Ali, M. A.; Ryder, R. A.; Anctil, M. PHOTORECEPTORS AND VISUAL PIGMENTS AS RELATED TO BEHAVIORAL RESPONSES AND PREFERRED HABITATS OF PERCHES (/PERCA/ SPP.) AND PIKEPERCHES (/STIZOSTEDION/ SPP.). J. Fish. Res. Board Can. 34 (10): 1475-1480. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Univ. Montreal, Montreal, PQ H3C 3J7, Canada]

78-000173 Bohlin, T. HABITAT SELECTION AND INTERCOHORT COMPETITION OF JUVENILE SEA-TROUT /SALMO TRUTTA/. Oikos 29 (1): 112-117. 1977. In English with Russian summ. SFA 23(1)
[Dep. Zool., Univ. Gothenburg, Sweden] By artificially changing the population density, the habitat preference of I+ sea-trout /Salmo trutta/ L. with respect to different biotopes was studied by electrofishing in a closed area of of a small stream. The trout seemed to prefer pools or rocky substrates to shallow, smooth-bottom riffles. Marking experiments supported the hypothesis of "owner's advantage" in the competition for space between resident and introduced fish, and revealed a marked stationarity in spite of possible experimental disturbances. There were significant differences between the mean lengths of I+ trout in the different biotopes, the deeper biotopes having the largest means. A few older trout showed a similar pattern. There were significant differences between the relative density of O+ trout in the different biotopes, the largest densities occurring in shallow, smooth-bottom riffles with low density of older trout. Stream tank experiments showed a tendency for competitive segregation between O+ and I+ trout, the latter being dominant and preferring pools to riffles. Field data of O+ and I+ density showed a biennial fluctuation with alternating peaks for O+ and I+ for a period of five consecutive years. Intercohort interaction, favoured by drought, was a probable cause.

78-000174 Boulekbache, H.; Deviller, C. ETUDE PAR MICROSCOPIE ELECTRONIQUE A BALAYAGE DES MODIFICATIONS DE LA MEMEBRANE DES BLASTOMERES AU COURS DES PREMIERS STADES DU DEVELOPPEMENT DE L'AEUF DE TRUITE (/SALMO IRIDEUS/ GIBB.). [SCANNING ELECTRON MICROSCOPY STUDY OF THE MEMBRANE RELIEF CHANGES OF THE BLASTOMERES DURING THE EARLY DEVELOPMENT STAGES OF THE RAINBOW TROUT EGG.] C. R. Hebd. Seances Acad. Sci. Ser D Sci. Nat. 285 (8): 917-920. 10 Oct. 1977. In French with English summ. SFA 23(1)
[Lab. Anat. Comp., Univ. Paris-VII, France] Our study relates to the development of the membrane relief of the blastomeres of the trout egg from the stage before their division up to gastrulation. The surface of the blastoderm shows first a more or less dense system of crests which by the time of gastrulation are replaced by microvilli distributed over the whole surface of the enveloping layer. The deep blastomeres, loosely connected to each other by lamellipodes and filopodes produce only a few projections of their membranes and these

78-000174 CONTINUED
are only semispherical bodies. Possible roles of the microvillosities in the respiratory exchanges of the egg and in the motility of the enveloping layer, are considered.

78-000175 Casterlin, M. E.; Reynolds, W. W. ASPECTS OF HABITAT SELECTION IN THE MOSQUITOFISH /GAMBUSIA AFFINIS/. Hydrobiologia 55 (2): 125-127. 18 Aug. 1977. SFA 23(1)
[Dep. Biol., Pa. State Univ., Wilkes-Barre 18708] Laboratory experiments were performed to determine behavioral preferences of /Gambusia affinis/ for habitat variables in partitioned aquaria. The fish preferred calm water, dark-colored substrates and subsurface vegetation providing lateral concealment. Floating cover, which obstructed access to the surface, was avoided. Lack of preference for real over plastic plant cover indicates that visual rather than chemical cues are involved. These laboratory preferences correspond to the reported microhabitat distribution of /G. affinis/ in nature and indicate the presence of an active habitat preference, as opposed to passive habitat correlation, in this species. Species-specific habitat preferences, which may be narrower where a species occurs sympatrically with its congeners, probably form part of a reproductive isolating mechanism.

78-000176 Craig, J. F. SEASONAL CHANGES IN THE DAY AND NIGHT ACTIVITY OF ADULT PERCH, /PERCA FLUVIATILIS/ L. J. Fish Biol. 11 (2): 161-166. Aug. 1977. SFA 23(1)
[Freshwater Biol. Assoc., Ferry House, Far Sawrey, Ambleside, Cumbria, England] /Perca fluviatilis/ L. were caught by gill nets every 3 h over a 24 h period monthly from February 1975 until January 1976. The numbers caught increased with rise in temperature (correlation coefficient /r/ = 0.86 /P/ less than 0.001). During the winter months perch migrated into deeper water although some fish were still caught in shallow water (1-6 m). Perch were active at very low light intensities. However changes in visual surface irradiance (400-700 nm) and water clarity caused inverse changes in activity. Only June did not conform to this pattern and it was presumed that spawning behaviour was of primary importance. It is suggested that increase in eutrophication with its effect on water clarity enables fish to become more active during the day in the summer months. They are thus able to utilise food sources to a maximum at an optimum period for feeding and growth.

78-000177 Gilbert, P. W. TWO DECADES OF SHARK RESEARCH: A REVIEW. Bioscience 27 (10): 670-673. Oct. 1977. SFA 23(1)
[Dep. Neurobiol. Behav., Cornell Univ., Ithaca, NY 14850]

78-000178 Green, J. M.; Fisher, R. A FIELD STUDY OF HOMING AND ORIENTATION TO THE HOME SITE IN /ULVARIA SUBBIFURCATA/ (PISCES: STICHAEIDAE). Can. J. Zool. 55 (9): 1551-1556. Sept. 1977. SFA 23(1)
[Dep. Biol. Mar. Sci. Res. Lab., Memorial Univ., St. John's, NF, Canada] The movements, homing behavior, and initial orientation to the capture site were investigated in /Ulvaria subbifurcata/ using an underwater habitat and scuba. Field experiments showed that this benthic species restricts its activity to a small home range, less than 3 m^2, is capable of returning to that home area after being displaced at least 270 m, and can orient in the direction of the home site after displacements of at least 30 m. The conditions under which the orientation experiments were conducted indicate that visual cues are not necessary for the orientational response.

78-000179 Greene, J. H. III; Adair, O. V. THE DESCRIPTION OF TWO PARAMETERS IN COLOR DISCRIMINATION IN /NOTROPIS SIGNIPINNIS/ (BAILEY AND SUTTKUS). J. Ala. Acad. Sci. 48 (3): 68-69. July 1977. SFA 23(1)
[Dep. Biol., Univ. South Ala., Mobile] Abstract only.

78-000180 Itzkowitz, M. SPATIAL ORGANIZATION OF THE JAMAICAN DAMSELFISH COMMUNITY. J. Exp. Mar. Biol. Ecol. 28 (3): 217-241. Aug. 1977. SFA 23(1)
[Dep. Zool., Univ. West Indies, Kingston, Jamaica] Juvenile damselfish probably settle randomly over a wide variety of substrata within a small area. The type and quantity of substrata determine movement, frequency of agonistic encounter, and the appearance of a hierarchy or territory. In mixed-species clusters, the largest juvenile, regardless of species, chases all others. The eventual formation of uni-specific adult colonies appears due to 1) differential mortality of the juveniles (probably selective predation) 2) substratum preferences of the adults, and 3) a behavioural system which inhibits other species from sharing a common territorial border on a homogeneous substratum.

78-000181 Lefebvre, L.; Sabourin, M. EFFECTS OF SPACED AND MASSED REPEATED ELICITATION ON TONIC IMMOBILITY IN THE GOLDFISH (/CARASSIUS AURATUS/). Behav. Biol. 21 (2): 300-305. Oct. 1977. SFA 23(1)
[Dep. Psychol., Univ. Montreal, Montreal, PQ H3C 3J7, Canada] The effects of repeated trials on tonic immobility in the goldfish were studied in two conditions, spaced and massed distribution of repeated elicitation. Spaced distribution led to a linear decrease in immobility over the 7 testing days, while massed trials produced an initial increase in the response followed by a decrease, regardless of whether reelicitation was immediate or occurred after a 10-sec intertrial interval. The spaced trial data are consistent with results reported in other vertebrate species, while the massed trial data are partially at variance with published data. Suggestions are made concerning the methodology to be used in future studies.

78-000182 Marusov, Ye. A. FRIGHT REACTION IN THE PREDATORY CYPRINID /OPSARIICHTHYS UNCIROSTRIS AMURENSIS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 685-688. 1976. SFA 23(1)
[Dep. Ichthyol., Moscow Univ., Moscow, USSR]

78-000183 Miley, W. M.; Burack, G. STRENGTH OF AGGRESSIVE DISPLAY IN SIAMESE FIGHTING FISH (/BETTA SPLENDENS/) TOWARD A CONSPECIFIC, AN ALIEN SPECIES (/MACROPODUS OPERCULARIS/), AND A MIRROR IMAGE AS AFFECTED BY PRIOR CONSPECIFIC VISUAL EXPERIENCE. Behav. Biol. 21 (2): 267-272. Oct. 1977. SFA 23(1)
[Stockton State Coll., Pomona, NJ 08240] Siamese fighting fish (/Betta splendens/) were provided with 10 days of visual experience with other conspecifics or were visually isolated from them for 10 days. Bettas were then allowed to display aggressively toward the following stimuli: a conspecific, an alien species (/Macropodus opercularis/), and a Mirror Image. Differences between intraspecific and interspecific displays depended on the response measure used. Isolated bettas displayed more frequently to conspecifics than did the visually experienced bettas, and more so than any other group. Visually experienced bettas showed longer latencies to conspecifics than did isolated bettas. However, there were no differences in the

78-000183 CONTINUED
other response measures (duration of display and time to absence of responding for 15 min) in any of the stimulus conditions. Whether there are differences between intraspecific aggression, interspecific aggression, and aggression toward a mirror image may depend on the response measures used and the proceudres leading up to behavioral testing.

78-000184 Ohi, S. EFFECTS OF ACTINOMYCIN D ON BRAIN RNA SYNTHESIS AND DISCRIMINATION LEARNING IN THE GOLDFISH (/CARASSIUS AURATUS/). Physiol. Behav. 19 (2): 261-264. Aug. 1977. SFA 23(1)
[Reprints from: Dep. Physiol., Sch. Dent., Tokyo Med. Dent. Univ. Yushima, Bunkyo-ku, Tokyo 113, Japan] Intracranial injection of actinomycin D 2 ug inhibited about 70 percent of the brain RNA synthesis from 3 hr to 4 days after injection in the goldfish. Under these conditions, fish were given 4-day-training of visual discrimination between a card with vertical stripes and one with horizontal stripes. Fish injected intracranially with actinomycin D showed defecits in between-day retention (long-term memory) but not interruption of within-day acquisition (short-term memory). It is suggested that brain RNA synthesis is necessary only for the formation of long-term memory but not short-term memory.

78-000185 Pfeiffer, W. THE DISTRIBUTION OF FRIGHT REACTION AND ALARM SUBSTANCE CELLS IN FISHES. Copeia 1977 (4): 653-665. 25 Nov. 1977. SFA 23(1)
[Dep. Biol., Univ. Tubingen, D-7400 Tubingen, Aur Der Morgenstelle 28, West Germany]

78-000186 Polunin, N. V. C.; Lubbock, R. PRAWN-ASSOCIATED GOBIES (TELEOSTEI: GOBIIDAE) FROM THE SEYCHELLES, WESTERN INDIAN OCEAN: SYSTEMATICS AND ECOLOGY. J. Zool. (Lond.) 183 (1): 63-101. Sept. 1977. SFA 23(1)
[Zool. Lab., Univ. Cambridge, Downing St., Cambridge, England] Fourteen species of gobies (Teleostei: Gobiidae), 12 of which were collected, were found living in association with seven "types" of alpheid prawn (Decapoda: Alpheidae) in the Seychelles, Western Indian Ocean. One new genus--/Stonogobiops/--and three new species--/Stonogobiops dracula/, /Cryptocentrus aurora/ and /C. wheeleri/--of prawn-associated goby are described. Full descriptions of the new genus and species, and shorter descriptions of the remaining species, are given; the genera /Iotogobius/ Smith and /Cryptocentrops/ Smith are synonymized with /Cryptocentrus/ Ehrenberg. Aspects of the ecology of the prawn-associated gobies were studied. Species specificity between gobies and prawns varied considerably. The species present exhibited a marked degree of habitat segregation, and there were differences between species in nearest-neighbour burrow distances. A wide range of degrees of looseness of association between goby and prawn was also observed. The evolution of the symbiosis is discussed in the light of these observations.

78-000187 Ryder, R. A. EFFECTS OF AMBIENT LIGHT VARIATIONS ON BEHAVIOR OF YEARLING, SUBADULT, AND ADULT WALLEYES (/STIZOSTEDION VITREUM VITREUM/). J. Fish. Res. Board Can. 34 (10): 1481-1491. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Fish Wildl. Br., Thunder Bay, ON, Canada]

78-000188 Solomon, D. J. A REVIEW OF CHEMICAL COMMUNICATION IN FRESHWATER FISH. J. Fish Biol. 11 (4): 363-376. Oct. 1977. SFA 23(1)
[Salmon Freshwater Fish. Lab., Minist. Agric. Fish. Food, 10 Whitehall Place, London SW1A 2HH, England] Since communication between individuals of a species of fish by chemical agents (pheromones) was first demonstrated in 1932, such a process has been suggested in many apsects of fish behaviour and development. This review describes observations on such mechanisms in shoaling behaviour and beneficial conditioning of water, homing of migratory fish, communication of alarm, 'crowding factor' (which adversely affects growth, survival and fecundity in dense populations), pair formation and spawning, and a range of other social interactions. Some of the chemicals involved have been isolated and identified, but most are indicated by behavioural observations. Pheromones are of great significance in fish behaviour and ecology, and are likely to be an important factor in culture operations.

78-000189 Thresher, R. E. PSEUDO-CLEANING BEHAVIOR OF FLORIDA REEF FISHES. Copeia 1977 (4): 768-769. 25 Nov. 1977. SFA 23(1)
[Scripps Inst. Oceanogr., P.O. Box 1529, La Jolla, CA 92037]

LIFE HISTORIES-GENERAL WORKS

78-000190 Burr, B. M. THE BANTOM SUNFISH, /LEPOMIS SYMMETRICUS/: SYSTEMATICS AND DISTRIBUTION, AND LIFE HISTORY IN WOLF LAKE, ILLINOIS. Ill. Nat. Hist. Surv. Bull. 31 (10): 433-466. Sept. 1977. SFA 23(1)
[Dep. Zool., South. Ill. Univ., Carbondale]

78-000191 Ching, C. V. STUDIES ON THE SMALL GREY MULLET /LIZA MALINOPTERA/ (VALENCIENNES). J. Fish Biol. 11 (3): 293-308. Sept. 1977. SFA 23(1)
[Dep. Zool., Univ. Malaya, Kuala Lumpur 22-11, Malaya] The growth of /Liza malinoptera/, which is analysed by its morphometric and length-weight relationships, is found to follow closely the so-called cubic law for isometric growth. The relative condition factor /Kn/ is used to investigate the condition cycle and for maturity studies. Fecundity and ova size are estimated. The fish is a herbivorous iliophage utilising mainly mangrove plant detritus at the first trophic level. Fine particle selection is demonstrated during feeding. Studies on the morphology and histolcgy of its alimentary tract indicate an adaptive correlation with its food and feeding habits.

78-000192 Claridge, P. N.; Gardner, D. C. THE BIOLOGY OF THE NORTHERN ROCKLING, /CILIATA SEPTENTRIONALIS/, IN THE SEVERN ESTUARY AND BRISTOL CHANNEL. J. Mar. Biol. Assoc. U.K. 57 (3): 839-848. Aug. 1977. SFA 23(1)
[Sch. Biol. Sci., Univ. Bath, Claverton Down, Bath BA2 7AY, England] Biological data have been collected from 353 northern rockling, /Ciliata septentrionalis/, removed from the cooling water intake screens of four power stations in the Severn Estuary and Bristol Channel between November 1972 and May 1976. Fish, mostly belonging to the first year class, were captured in the Estuary from October to May and reached peak abundance in February and March. During this period, feeding activity was low, with amphipods forming the major constituent of the diet, and gonad maturation took place in all of the three age groups present. Mature females were noted in March although no

78-000192 CONTINUED
evidence of spawning was found in the area. The relationship between standard length and wet weight has been described and significant differences have been shown between the sexes for several proportional body measurements. Between 1972 and 1976 there was a marked increase in the number of northern rockling collected from the Estuary and Bristol Channel.

78-000193 Collette, B. B.; Ali, M. A.; Hokanson, K. E. F.; Nagiec, M.; Smirnov, S. A.; Thorpe, J. E.; Weatherley, A. H.; Willemsen, J. BIOLOGY OF THE PERCIDS. J. Fish. Res. Board Can. 34 (10): 1890-1899. Oct. 1977. In English with French summ. SFA 23(1)
[NMFS, Syst. Lab., U.S. Natl. Mus., Washington, DC 20560]

78-000194 De Silva, S. S.; Kortmulder, K. SOME ASPECTS OF THE BIOLOGY OF THREE SPECIES OF /PUNTIUS/ (= /BARBUS/) (PISCES, CYPRINIDAE), ENDEMIC TO SRI LANKA. Neth. J. Zool. 27 (2): 182-194. June 1977. SFA 23(1)
[Dep. Zool., Vidyalankara Campus, Univ. Sri Lanka, Kelaniya, Sri Lanka] Morphometrics, aspects of the food and feeding habits, and the reproductive biology of /Puntius nigrofasciatus/, /P. cumingi/ and /P. pleurotaenia/, all three barbs endemic to Sri Lanka (Ceylon) and found to inhabit mountain streams, are described. In addition the general habits and activity patterns of the three species are also dealt with. All three species of barbs are primarily herbivorous in their food habits, with an overlap in the dietary composition to a significant extent. However, the possible avoidance of potential "competition" among the three species in discussed. /Puntius nigrofasciatus/ was found to be a serial spawner with a number of spawning periods in a year. The fecundity of this species was found to vary between 151 and 638 for fish ranging in length from 46-64 mm and 1.60-3.93 gm in weight. The absence of mature individuals in stage IV and above of /P. cumingi/ and /P. pleurotaenia/ is thought to indicate their more seasonal nature of the spawning period.

78-000195 Gilmore, R. G. NOTES ON THE OPOSSUM PIPEFISH, /OOSTETHUS LINEATUS/, FROM THE INDIAN RIVER LAGOON AND VICINITY, FLORIDA. Copeia 1977 (4): 781-783. 25 Nov. 1977. SFA 23(1)
[Harbor Branch Foundation, Inc., RFD 1, Box 196, Fort Pierce, FL 33450]

78-000196 Gorbunova, N. N. THE CLASSIFICATION AND DISTRIBUTION OF THE LARVAE OF INDO-PACIFIC SPECIES OF BILLFISHES FROM THE FAMILY ISTIOPHORIDAE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 437-452. 1976. SFA 23(1)
[IOAN, USSR Acad. Sci., Moscow, USSR] Differences in the relation between body length and stages of formation which together with certain morphological features can be used in determining the young of this group of fish have been noted in the larvae of five Indo-Pacific species of the family Istiophoridae. The larvae of the genus /Makaira/ are distinguished by large eyes, a short rostrum and a deep body. The relative length of the upper and lower jaws hardly changes throughout the larval period of development. The larvae of /M. nigricans/ are distinguished from the larvae of /M. indica/ by a more rapid rate of development and a rigid attachment of the pectoral fins. The larvae of the genus /Tetrapturus/ are characterized by a smaller eye diameter and a lesser body depth. In larvae 11.0-12.0 mm long, the upper jaw becomes elongated. The larvae of /T. angustirostris/ and /T. audax/ are distinguished by body depth, length and shape of upper jaw, and number of rays in D(1) and P. Furthermore, the formation of the larvae

78-000196 CONTINUED
of /T. audax/ occurs at smaller sizes than that of the larvae of /T. angustirostris/. The reproductive regions of billfishes in the Pacific Ocean are situated mainly in the western part of the ocean from 30°N to 25°S and approximately up to 130°W. The main reproductive region in the Indian Ocean is confined to the eastern regions and to the region of the Indo-Australian archipelago. The water temperature in the spawning regions is 25-29°. Spawning takes place both in coastal regions (/I. platyperus/, /M. indica/) and far out in the ocean, but near to oceanic islands. In tropical waters spawning is possible throughout the year; in subtropical waters the spawning time is restricted to the spring-summer period, but in /T. audax/ spawning is possible also in the autumn-winter months. The larvae of billfishes change over to predatory feeding at a length of 6.0 mm.--From concl.

78-000197 Henricson, J.; Nyman, L. THE ECOLOGICAL AND GENETICAL SEGREGATION OF TWO SYMPATRIC SPECIES OF DWARFED CHAR (/SALVELINUS ALPINUS/ (L.) SPECIES COMPLEX). Rep. Inst. Freshwater Res. Drottingholm No. 55. p. 15-37. 1976. SFA 23(1)
[Dep. Biol., Univ., Umea, S-901 87 Umea, Sweden] A lake system in southern Swedish Lapland has been found to harbour two sympatric species of Arctic char. To find out the optimal set of parameters for discrimination between the two species and for classifying individual fish to species, multivariate data analysis with methods of pattern recognition was attempted. Parasites and food items proved valuable. Species determination, gene flow and introgression discussions are based on allele frequency data from a blood serum esterase polymorphism. It is shown that both species are dwarfed forms and that hybridization has proceeded at a different rate in the three lakes studied. With increasing introgression the difference in length-age distribution between the two species is reduced. Special attention has been paid to qualitative and quantitative data on the parasite faunas and food habits during different seasons. One species is shown to be more pelagic in its food habits, the other more benthic. The food segregation is most marked in the autumn. This is also reflected in the parasite faunas. Several biological and management implications of the findings are discussed.--Summ.

78-000198 Hesthagen, I. H. MIGRATIONS, BREEDING, AND GROWTH IN /PCMATOSCHISTUS MINUTUS/ (PALLAS) (PISCES, GOBIIDAE) IN OSLOFJORDEN, NORWAY. Sarsia 63 (1): 17-26. 30 Sept. 1977. SFA 23(1)
[Inst. Mar. Biol. Limnol., Univ. Oslo, P.B. 1064, Blindern Oslo 3, Norway] Aspects of the biology of the sand goby were studied over a period of 21 months. The goby is common in the littoral from April (at temperatures above 3°C) to July, when breeding takes place, and from September to December, when the somatic growth occurs. At temperatures above 19°C and below 4-5°C the goby is rare in the littoral. The growth is very rapid, the 0-group fish reaching almost the length of the 1-group fish during their first growing season. Growth is faster than in other populations from similar latitudes, suggested to be due to eutrophication. Spawning occurs even in less than 1 m depth. There is an indication that light intensity, together with temperature, is important for breeding to start. The food consists of any organism of appropriate size and texture. Polychaetes are a conspicuous component. Feeding occurs intensively all through the stay in the littoral, but is lower during the breeding season. Various features of the biology of the sand goby in Oslofjorden appear to be simple and more clearcut when compared to other populations studied, probably due to the stable and predictable environmental conditions.

78-000199 Houde, E. D. ABUNDANCE AND POTENTIAL YIELD OF THE SCALED SARDINE, /HARENGULA JAGUANA/, AND ASPECTS OF ITS EARLY LIFE HISTORY IN THE EASTERN GULF OF MEXICO. NOAA Fish. Bull. 75 (3): 613-628. July 1977. SFA 23(1)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Richenbacker Causeway, Miami, FL 33149] Eggs and larvae of the scaled sardine, /Harengula jaguana/, were collected in 1971-74 from the eastern Gulf of Mexico to determine spawning seasons, spawning areas, adult biomass, and fisheries potential. Aspects of the early life history of the species also were studied. Spawning occurred from January to September, but was most intense from May to August, when surface temperatures ranged from 20.8° to 30.7°C and surface salinites were 29.9 to 36.9°/oo. All spawning occurred between the coast and the 30-m depth contour, mostly within 50 km of the coast. The biomass of scaled sardines, based on annual spawning estimates, apparently increased from 1971 to 1973, the mean estimate for the 3 yr being 184,527 metric tons. Potential yield estimates, based on the 3-yr mean biomass, ranged from 46,000 to 92,000 metric tons. Larval abundance and mortality rates were estimated from 1973 data. More than 99.9 percent mortality occurred between time of spawning and attainment of 15.5 mm standard length at 20 days of age. Comparisions were made of scaled sardine distribution, abundance, potential yield, and larval mortality with those of other eastern Gulf clupeids.

78-000200 Jolley, J. W., Jr. THE BIOLOGY AND FISHERY OF ATLANTIC SAILFISH /ISTIOPHORUS PLATYPTERUS/, FROM SOUTHEAST FLORIDA. Fla. Mar. Res. Publ. No. 28. 31p. July 1977. SFA 23(1)
[Fla. Dep. Nat. Resour., Mar. Res. Lab., 100 8th Ave. SE, St. Petersburg 33701]

78-000201 Kelso, J. R. M.; Bagenal, T. B. PERCIDS IN UNPERTURBED ECOSYSTEMS. J. Fish. Res. Board Can. 34 (10): 1959-1963. Oct. 1977. In English with French summ. SFA 23(1)
[Fish. Mar. Serv., Great Lakes Biolimnol. Lab., Sault Ste. Marie, ON P6A 2B3, Canada]

78-000202 Kerr, S. R.; Ryder, R. A. NICHE THEORY AND PERCID COMMUNITY STRUCTURE. J. Fish. Res. Board Can. 34 (10): 1952-1958. Oct. 1977. In English with French summ. SFA 23(1)
[Fish. Mar. Serv., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-000203 Kitchell, J. F.; Johnson, M. G.; Minns, C. K.; Loftus, K. H.; Greig, L.; Olver, C. H. PERCID HABITAT: THE RIVER ANALOGY. J. Fish. Res. Board Can. 34 (10): 1936-1940. Oct. 1977. In English with French summ. SFA 23(1)
[Lab. Limnol., Univ. Wis., Madison 53706]

78-000204 Kovalev, P. M. LARVAL DEVELOPMENT OF THE PIKE-PERCH /LUCIOPERCA LUCIOPERCA/ UNDER NATURAL CONDITIONS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 606-616. 1976. SFA 23(1)
[Dep. Zool., Novogorodsk Pedagog. Inst., USSR] The morphogenesis, feeding and behavior of the pike-perch, /Lucioperca lucioperca/, during the larval period in Lake Il'men' was studied. Comparative data on the development of the larvae of the Il'men' and Don' pike-perch are presented. It is recommended that the features of morphogenesis, feeding and spatial dissemination at different stanzas of the larval period be taken into account for artificial propagation and also when

78-000204 CONTINUED
determining the abundance of the young.

78-000205 Marshall, T. R. MORPHOLOGICAL, PHYSIOLOGICAL, AND ETHOLOGICAL DIFFERENCES BETWEEN WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND PIKEPERCH (/S. LUCIOPERCA/). J. Fish. Res. Board Can. 34 (10): 1515-1523. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Fish Wildl. Br., Thunder Bay, ON, Canada]

78-000206 Page, L. M.; Burr, B. M. THE LIFE HISTORY OF THE SLABROCK DARTER, /ETHEOSTOMA SMITHI/, IN FERGUSON CREEK, KENTUCKY. Ill. Nat. Hist. Surv. Biol. Note No. 99. 12p. Dec. 1976. SFA 23(1)
[Ill. Nat. Hist. Surv., Urbana 61801]

78-000207 Potter, I. C.; Beamish, F. W. H. THE FRESHWATER BIOLOGY OF ADULT ANADROMOUS SEA LAMPREYS /PETROMYZON MARINUS/. J. Zool. (Lond.) 181 (1): 113-130. Jan. 1977. SFA 23(1)
[Sch. Environ. Life Sci., Murdock Univ., Murdock 6153, Perth, Western Australia] The lengths, weights, and condition factors of young adult lampreys caught feeding on Gaspereau, Shad, and White sucker in the lake-like extensions of the St. John River system during May, suggest that many lampreys do not feed in the nine to ten months following the initiation of metamorphosis in mid-July. Since several of the 81 feeding adults caught between the latter part of June and mid-July, at a point 140 km from the estuary of the St. John, were still attached to spawning-run Atlantic salmon, this teleost host had probably been responsible for their transport upstream. The wide range in their length (156-403 mm), together with the presence in the lakes in May of a few young adults larger than those which have only just started feeding, suggest that the time of onset of the parasitic phase is variable but may generally commence in either the late autumn or in the spring. Scarring on salmon due to lamprey attack was predominantly (84 percent) on the ventral surface between the operculum and caudal peduncle. Over 35 percent of the salmon examined in June 1975 had been attacked. While lamprey attacks may cause some mortality among the smaller teleosts, any effect on salmon is probably indirect through causing increased susceptibility to infection and stress. The abiltiy of adult anadromous Sea lampreys to feed and grow in fresh water demonstrates the relative ease with which landlocked forms could have been evolved in response to extreme environmental changes. This evolutionary step has involved a decline in the ability to osmoregulate in high salinities and a reduction in body size and fecundity. Data on upstream migrants indicate the males and females undergo length reductions of at least 11 and 15 percent respectively between the time of their entry into fresh water and the completion of spawning.--From abstr.

78-000208 Starnes, W. C. THE ECOLOGY AND LIFE HISTORY OF THE ENDANGERED SNAIL DARTER, /PERCINA (IMOSTOMA) TANASI/ ETNIER. Tenn. Wildl. Resour. Agency Fish. Res. Rep. 77-52. 143p. 1977. SFA 23(1)
[TVA, FF&WD, Norris, TN 37828] A 2-year study of the ecology and life history of the snail darter, /Percina tanasi/, was conducted from 1974 to 1976. The snail darter was found to be a strictly benthic species principally associated with a large river gravel shoal habitat where it feeds and reproduces. Its present range is restricted to the lower Little Tennessee River and a small adjacent portion of the Tennessee River. It is speculated that /P. tanasi/ once occupied a much wider range in the upper Tennessee River drainage which has since been curtailed by impoundments. This species was found to be a short-

78-000208 CONTINUED
lived darter which, along with other members of the subgenus /Imostoma/, spawns in mid-winter. Larval drift is a significant event in the life of the snail darter, and early development is very slow. Adults are migratory, especially during the breeding season. The principal diet constituents are gastropods; there is some utilization of insects. A high degree of selectivity is exercised in procuring the gastropod diet, and there are seasonal trends in both diet composition and consumption levels. /P. tanasi/ occupies a remote position in the Little Tennessee food web. Predation is thought to be high on the eggs and larval stages of /P. tanasi/ but low on adults. Parasitism is very low. The present ecological situation of the snail darter is thought to be considerably altered from that of preimpoundment days. It is threatened with extinction if the remainder of its habitat is inundated by the Tellico Dam.

78-000209 Thorpe, J. E. MORPHOLOGY, PHYSIOLOGY, BEHAVIOR, AND ECOLOGY OF /PERCA FLUVIATILIS/ L. AND /P. FLAVESCENS/ MITCHILL. J. Fish. Res. Board Can. 34 (10): 1504-1514. Oct. 1977. In English with French summ. SFA 23(1)
[Freshwater Fish. Lab., Pitlochry PH16 5LB, Scotland]

POPULATION STUDIES, PRODUCTION, ETC.

78-000210 Adams, G. F.; Olver, C. H. YIELD PROPERTIES AND STRUCTURE OF BOREAL PERCID COMMUNITIES IN ONTARIO. J. Fish. Res. Board Can. 34 (10): 1613-1625. Oct. 1977. In English with French summ. SFA 23(1)
[Manitoba Dep. Renewable Resour. Transport. Serv., Fish. Sect., Winnipeg, MB, Canada]

78-000211 Boaze, J. L.; Kochman, E. AN EVALUATION OF THE FISH POPULATION NORTH FORK OF THE SOUTH PLATTE RIVER. U.S. Fish Wildl. Serv., Salt Lake City, Utah 18p. 1977. SFA 23(1)
[U.S. Fish Wildl. Serv., Salt Lake City, UT] Baseline data for the brown trout (/Salmo trutta/) population in the North Fork of the South Platte River was developed for use in analyzing possible additional stream modification. A comparison of modified and unmodified stream sections indicates the main difference in the population structure is the number of harvestable (≥20.3 cm) size fish present. Modified sections contained 9.5 percent harvestable fish. Unmodified sections contained 51.9 percent harvestable size fish. Population estimates for study area indicated a standing crop of 885 (158.7 kg) brown trout per hectare.

78-000212 Bonar, A. RELATIONS BETWEEN EXPLOITATION, YIELD, AND COMMUNITY STRUCTURE IN POLISH PIKEPERCH (/STIZOSTEDION LUCIOPERCA/) LAKES, 1966-71. J. Fish. Res. Board Can. 34 (10): 1576-1580. Oct. 1977. In English with French summ. SFA 23(1)
[Acad. Agric. Technol., Inst. Ichthyobiol. Fish., olsytyn, Poland]

78-000213 Carlander, K. D. BIOMASS, PRODUCTION, AND YIELDS OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND YELLOW PERCH (/PERCA FLAVESCENS/) IN NORTH AMERICAN LAKES. J. Fish. Res. Board Can. 34 (10): 1602-1612. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50010]

78-000214 Coulter, G. W. APPROACHES TO ESTIMATING FISH BIOMASS AND POTENTIAL YIELD IN LAKE TANGANYIKA. J. Fish Biol. 11 (5): 393-408. Nov. 1977. SFA 23(1)
[Dep. Sci. Ind. Res., P.O. Box 1451, Taupo, New Zealand] The annual fish yield of 73,000 tonnes (22.5 kg/ha) from Lake Tanganyika consists primarily of two planktivorous clupeids /Stolothrissa tanganicae/ (Stdr.) and /Limnothrissa miodon/ (Blgr.) and their centropomid predators, three /Lates/ species (Nile perch) and /Luciolates stappersii/ (Blgr.). At the north and south ends of the lkae, the /Lates/ spp. have been fished-up by purse-seines, and the clupeids and young /L. stappersii/ predominate there. Estimates of pelagic fish biomass may employ (i) catch and fishing effort data (ii) abiotic variables (iii) echo-sounding surveys (iv) tropho-dynamic relationships.

78-000215 Donald, D. B.; Kooyman, A. H. MIGRATION AND POPULATION DYNAMICS OF THE PEACE-ATHABASCA DELTA GOLDEYE POPULATION. Can. Wildl. Serv. Occas. Pap. No. 31. 21p. 1977. In English with French summ. SFA 23(1)
[Can. Wildl. Serv., Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada] Goldeye (/Hiodon alosoides/) begin moving into the Peace-Athabasca Delta area in March, but do not enter the delta lakes until after break-up in the Peace River in May. Mature goldeye spawn in the delta lakes primarily between the middle and the end of May. Goldeye of all ages begin migrating from the delta in July. The majority of adult goldeye return to the Peace River by the end of August, but some young remain in the delta until at least early December. All of these goldeye winter in the Peace River. The distance from the wintering areas in the Peace River to the delta and back can be as much as 700-800 km for some fish. The eggs of goldeye hatch in early June and mortality of the larvae is high during that month, but for the rest of the summer numbers remain relatively constant. Between 1971 and 1974, year-class strength was highly unbalanced. The unusual year-class abundances and growth rates in the early 1970's are attributed to over-harvest of this population by the 1948-66 commercial fishery, and not to unusually low water levels in the delta between 1968 and 1971. The natural mortality of the adult stock was about 51 percent and recruitment was negligible for 2 years in the early 1970's. The numbers of adult fish which entered the delta in 1972, 1973 and 1974 were considerably less than the numbers of adult fish in the 1940's and 1950's. The adult stock will recover in numbers in 1977 and 1978, the years when the 1971 year-class of goldeye are 6 and 7 years old.--From abstr.

78-000216 Houde, E. ABUNDANCE AND POTENTIAL YIELD OF THE ATLANTIC THREAD HERRING, /OPISTHONEMA OGLINUM/, AND ASPECTS OF ITS EARLY LIFE HISTORY IN THE EASTERN GULF OF MEXICO. NOAA Fish. Bull. 75 (3): 493-512. July 1977. SFA 23(1)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Richenbacker Causeway, Miami, FL 33149] Eggs and larvae of the Atlantic thread herring, /Opisthonema oglinum/, were collected in plankton surveys from 1971 to 1974 in the eastern Gulf of Mexico to determine spawning seasons, spawning areas, adult biomass, and potential yield to a fishery. Aspects of the early life history also were studied. Spawning

78-000216 CONTINUED
occurred from February to September, but mostly from April through August, when surface temperatures were 22.5° to 30.3°C and surface salinities ranged from 32.4 to 36.8°/oo. Most spawning took place from the coastline out to the 30-m depth contour, and virtually all spawning occurred where depths were less than 50 m. The area of heaviest spawning was between latitudes 26°00'N and 28°00'N. The most reliable estimates of adult biomass were approximatley 110,000 metric tons in 1971 and 370,000 metric tons in 1973. The most probable estimates of potential annual yield range from 60,300 to 120,600 metric tons. Based on the best larval mortality estimates, more than 99 percent mortality occurred from time of spawning until 19 days and 15.5 mm standard length in 1973, and approximately 98 percent mortality occurred for the same period in 1971.

78-000217 Jensen, K. W. ESTIMATES OF A POPULATION OF SPAWNING PERCH (/PERCA FLUVIATILIS/ L.) AND OF THE EFFICIENCY OF TRAP AND GILL-NET FISHING. Rep. Inst. Freshwater Res. Drottinghclm No. 55. p. 45-50. 1976. SFA 23(1)
[Dir. Wildl. Freshwater Fish, N-1432 As-NLH, Norway] In a 46.5 hectare oligotrophic forest lake near Oslo, Norway, the population of spawning male perch was estimated by means of tagging-recapture of perch caught in wire-mesh traps. The estimated fraction of tagged adult males/untagged adult males was later controlled twice by experimental gill-net fishing and found correct. Continuous fishing through the 14 days' spawning period with 0.4 traps per hectare lifted twice to once daily caught 40-50 percent of all spawning male perch. The traps caught an insignificant fraction of the adult female perch. The recapture figures indicate that a substantial proportion (tentatively 1/2) of the population of adult females were caught by a fishing effort of about 3 gill-net nights per hectare lake area.--Summ.

78-000218 Johnston, D. A. POPULATION DYNAMICS OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND YELLOW PERCH (/PERCA FLAVESCENS/) IN LAKE ST. CLAIR, ESPECIALLY DURING 1970-76. J. Fish. Res. Board Can. 34 (10): 1869-1877. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Lake St. Clair Fish. Assessment Unit, Tilbury, ON N0P 2L0, Canada]

78-000219 Kempinger, J. J.; Carline, R. F. DYNAMICS OF THE WALLEYE (/STIZOSTEDION VITREUM VITREUM/) POPULATION IN ESCANABA LAKE, WISCONSIN, 1955-72. J. Fish. Res. Board Can. 34 (10): 1800-1811. Oct. 1977. In English with French summ. SFA 23(1)
[Wis. Dep. Nat. Resour., Woodruff 54568]

78-000220 Kerr, S. R. STRUCTURE AND TRANSFORMATION OF FISH PRODUCTION SYSTEMS. J. Fish. Res. Board Can. 34 (10): 1989-1993. Oct. 1977. In English with French summ. SFA 23(1)
[Fish. Mar. Serv., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-000221 McConnell, W. J.; Lewis, S.; Olson, J. E. GROSS PHOTOSYNTHESIS AS AN ESTIMATOR OF POTENTIAL FISH PRODUCTION. Trans. Am. Fish. Soc. 106 (5): 417-423. Sept. 1977. SFA 23(1)
[Colo. Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins 80523]

78-000222 Nelson, W. R.; Walburg, C. H. POPULATION DYNAMICS OF YELLOW PERCH (/PERCA FLAVESCENS/), SAUGER (/STIZOSTEDION CANADENSE/), AND WALLEYE (/S. VITREUM VITREUM/) IN FOUR MAIN STEM MISSOURI RIVER RESERVOIRS. J. Fish. Res. Board Can. 34 (10): 1748-1763. Oct. 1977. In English with French summ. SFA 23(1)
[USFWS, North Cent. Reservoir Invest., Pierre, SD 57501]

78-000223 Nepszy, S. J. CHANGES IN PERCID POPULATIONS AND SPECIES INTERACTIONS IN LAKE ERIE. J. Fish. Res. Board Can. 34 (10): 1861-1868. Oct. 1977. In English with French summ. SFA 23(1)
[Lake Erie Fish. Res. Stn., Ontario Minist. Nat. Resour., Wheatley, ON N0P 2P0, Canada]

78-000224 Russell, B. C. POPULATION AND STANDING CROP ESTIMATES FOR ROCKY REEF FISHES OF NORTH-EASTERN NEW ZEALAND. N. Z. J. Mar. Freshwater Res. 11 (1): 23-36. Mar. 1977. SFA 23(1)
[Sch. Biol. Sci., Maequarie Univ., North Ryde, N.S.W. 2113, Australia] Estimates of the population and standing crop of fishes were made in six selected transect areas around Goat Island (174° 47' 50" E, 36° 16' 10" S), a typical rocky reef area on the coast of north-eastern New Zealand. There were considerable differences in the numbers of species and individuals between the sampling areas. Chance encounters with schools of "transient" fishes was a major source of variation between replicate censuses. Amongst the "resident" species, variation in numbers could be attributed to habitat differences. Bottom topography and algal cover are important factors affecting the distribution and abundance of reef fishes. Standing crop estimates of resident fishes ranged from less than 0.001 $kg \cdot m^{-2}$ (low relief bottom, sparse algal cover) to 0.103 $kg \cdot m^{-2}$ (high relief bottom, extensive algal cover). These figures are similar to those obtained for Californian kelp beds and for coral reefs. Reef fish populations are susceptible to exploitation and the scarcity of larger fishes in two of the study areas could be attributed to spearfishing. Resident species are most vulnerable to spearfishing, and legal protection for these fishes is suggested.

78-000225 Schupp, D. H.; Macins, V. TRENDS IN PERCID YIELDS FROM LAKE OF THE WOODS, 1888-1973. J. Fish. Res. Board Can. 34 (10): 1784-1791. Oct. 1977. In English with French summ. SFA 23(1)
[Minn. Dep. Nat. Resour., Div. Fish Wildl., Brainerd 56401]

78-000226 Shuter, B. J.; Koonce, J. F. A DYNAMIC MODEL OF THE WESTERN LAKE ERIE WALLEYE (/STIZOSTEDION VITREUM VITREUM/) POPULATION. J. Fish. Res. Board Can. 34 (10): 1972-1982. Oct. 1977. In English with French summ. SFA 23(1)
[Univ. Toronto, Toronto, ON, Canada]

78-000227 Sissenwine, M. P. A COMPARTMENTALIZED SIMULATION MODEL OF THE SOUTHERN NEW ENGLAND YELLOWTAIL FOUNDER, /LIMANDA FERRUGINEA/, FISHERY. NOAA Fish. Bull. 75 (3): 465-482. July 1977. SFA 23(1)
[NMFS, Northeast Fish. Cent., Woods Hole, MA 02543] A compartmentalized simulation model of the Southern New England yellowtail flounder, /Limanda ferruginea/, fishery was developed. The population was divided into 10 age-groups, each of which was subdivided into 7 size categories. The model simulated discard mortality as well as natural mortality and fishing mortality. Fishing and discard mortality rates depended on the level of fishing and on gear and market selection factors. Both linear and density independent stock-recruitment functions were considered. Seasonal variations in growth and exploitation were incorporated into the model. The influence of fluctuation in temperature on recruitment and growth was also simulated. The model using a linear stock-recruitment function accounted for 85.5 percent of the variability in the yield of the fishery for 1943-65; with a density independent stock-recruitment function, the model explained 83.2 percent of the variability in yield for the same period. The linear stock-recruitment model was used to investigate the response of the fishery to alternative fishing strategies. Substantial increases in the past yield of the fishery were indicated by the model when fishing effort was concentrated during the second half of the year and when fishing effort and discard mortality were reduced.

78-000228 Smith, L. L., Jr. WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND YELLOW PERCH (/PERCA FLAVESCENS/) POPULATIONS AND FISHERIES OF THE RED LAKES, MINNESOTA, 1930-75. J. Fish. Res. Board Can. 34 (10): 1774-1783. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Entomol. Fish. Wildl., 132A Hodson Hall, Univ. Minn., St. Paul 55108]

78-000229 Spangler, G. R.; Payne, N. R.; Winterton, G. K. PERCIDS IN THE CANADIAN WATERS OF LAKE HURON. J. Fish. Res. Board Can. 34 (10): 1839-1848. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Fish. Wildl. Br., Fish. Res. Stn., Tehkummah, ON P0P 2C0, Canada]

78-000230 Verdon, R.; Magnin, E. DYNAMIQUE DE LA POPULATION DE MEUNIERS NOIRS /CATOSTOMUS COMMERSONI COMMERSONI/ (LACEPEDE) DU LAC CROCHE DANS LES LAURENTIDES, QUEBEC. [POPULATION DYNAMICS OF THE WHITE SUCKER /CATOSTOMUS COMMERSONI COMMERSONI/ (LACEPEDE) OF LAKE CROCHE IN THE LAURENTIANS, QUEBEC.] Nat. Can. (Que.) 104 (3): 197-206. May-June 1977. In French with English summ. SFA 23(1)
[Dep. Sci. Biol., Univ. Montreal, Montreal, PQ Canada] Marking experiments carried out in 1974 and 1975 provided an estimate of 4,300 /Catostomus commersoni/, age 3 and older, in the population of lake Croche; a density of 180/ha. The annual mortality rate increases with age: 21 percent at 2 years old, 27 percent at 3 and 4 years old, 40 percent at 5 years old, 76 percent at 6 years old and 90 percent for 7 years of age and older fishes. Biomass of individuals 3 years of age and older has been estimated at 681 kg (29 kg/ha) and their total production at 163.8 kg.

78-000231 Wells, L. CHANGES IN YELLOW PERCH (/PERCA FLAVESCENS/) POPULATIONS OF LAKE MICHIGAN, 1954-75. J. Fish. Res. Board Can. 34 (10): 1821-1829. Oct. 1977. In English with French summ. SFA 23(1)
[USFWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

78-000232 Willemsen, J. POPULATION DYNAMICS OF PERCIDS IN LAKE IJSSEL AND SOME SMALLER LAKES IN THE NETHERLANDS. J. Fish. Res. Board Can. 34 (10): 1710-1719. Oct. 1977. In English with French summ. SFA 23(1)
[Netherlands Inst. Fish. Invest., IJmuiden, Netherlands]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

78-000233 Balon, E. K.; Momot, W. T.; Regier, H. A. REPRODUCTIVE GUILDS OF PERCIDS: RESULTS OF THE PALEOGEOGRAPHICAL HISTORY AND ECOLOGICAL SUCCESSION. J. Fish. Res. Board Can. 34 (10): 1910-1921. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-000234 Blake, B. F. ASPECTS OF THE REPRODUCTIVE BIOLOGY OF /HIPPOPOTAMYRUS PICTUS/ FROM LAKE KAINJI, WITH NOTES ON FOUR OTHER MORMYRID SPECIES. J. Fish Biol. 11 (5): 437-445. Nov. 1977. SFA 23(1)
[Dep. Zool., Univ. Reading, Whiteknights, Reading, Berkshire, England] A method is described for the assessment of fecundity in mormyrid fish. In all species examined a tri-modal egg size distribution was found in the mature pre-spawning ovary. These modes represented one oocyte and two ova components. The significance of the presence of two sizes of ovum is discussed in relation to breeding periodicity in /Hippopotamyrus pictus/. Size and age at first maturity are estimated for this species. The probable effects of the formation of the lake on the breeding behaviour of mormyrids is discussed.

78-000235 Cala, P. AGE AT MATURITY, TESTICULAR DEVELOPMENT AND SEASONAL CHANGES IN THE TESTES OF THE IDE /IDUS IDUS/ (L.) (PISCES, CYPRINIDAE) IN THE RIVER KAVLINGEAN, SOUTH SWEDEN. Rep. Inst. Freshwater Res. Drottingholm No. 55. p. 5-14. 1976. SFA 23(1)
[Dep. Biol., Apt. 7495, Univ. Nac. Colombia, Bogata, Colombia]

78-000236 Campbell, J. S. SPAWNING CHARACTERISTICS OF BROWN TROUT AND SEA TROUT /SALMO TRUTTA/ L. IN KIRK BURN, RIVER TWEEN, SCOTLAND. J. Fish Biol. 11 (3): 217-229. Sept. 1977. SFA 23(1)
[Fish. Mar. Serv., Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada] The upstream spawning migrations of brown trout and sea trout were studied using stationary traps placed in Kirk Burn, a tributary of the upper Tweed. The sea trout spawning period extended from early November to the first week of December, while that of brown trout occurred from the middle of October to the third week of December. Sea trout were predominantly maiden spawners of ages 2.1+ and 3.1+ while brown trout were mostly age 2+ and 3+. Male-female sex ratios approximated 1:1.4 in sea trout but 6:1 in brown trout. Brown trout males participated in the spawning activities of sea trout. Low water conditions in Kirk Burn hindered the upstream movement of spawning sea trout, while sudden increases in water level appeared to stimulate the upstream migration of both brown trout and

78-000236 CONTINUED
sea trout. The suggestion is advanced that the freshwater resident brown trout of the Tweed which migrate upstream into the smaller tributaries to spawn is wholly, or at least partially, the progeny of anadromous parents.

78-000237 Crossland, J. SEASONAL REPRODUCTIVE CYCLE OF SNAPPER /CHRYSOPHRYS AURATUS/ (FORSTER) IN THE HAURAKI GULF. N. Z. J. Mar. Freshwater Res. 11 (1): 37-60. Mar. 1977. SFA 23(1)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19-362, Wellington, New Zealand] The seasonal reproductive rhythm of the snapper /Chrysophrys auratus/ (Forster), was studied from November 1973 to April 1975. Methods used were to analyse gonad maturity stages, gonad weights, and ovarian egg sizes. The histolcgy of the gonads was also studied. Snapper was shown to be a serial spawner, producing many batches of eggs in one season. In 1974-75 the spawning season extended from October to January. In the non-breeding season the gonadosomatic index (gonad weight as a percentage of body weight) was less than 1.0. In the spawning season this rose to 6.1 in males, and to 6.9 in females. Histological studies showed oogonia present throughout the year, with the main period of production occurring after spawning. Primary eggs were always much more numerous than all other types. An egg cycle, from oogonium to ripe spawned egg, of 3-4y was estimated. Developing eggs remaining in the ovary after spawning were resorbed.

78-000238 Figley, W. SEX RATIOS WITHIN LENGTH GROUPS CF COMMERCIALLY CAUGHT SUMMER FLOUNDER IN NEW JERSEY. N.J. Dep. Environ. Prot. Bur. Fish Tech. Rep. No. 20M. 16p. June 1977. SFA 23(1)
[N.J. Dep. Environ. Prot., Bur. Fish., Nacote Creek Res Stn.] The sex ratio of summer flounder (/Paralichthys dentatus/) caught by commercial trawlers during two sampling periods was analyzed by total length centimeter groups. Males comprised the majority of flounder in centimeter groups below 43 cms in the first period and below 47 cms in the second period, while females were predominant in larger length groups. The largest male sampled was 61.7 cm; the largest female was 73.0 cm. The sex ratio for all centimeter groups combined was 1:1.16 and 1:1.17 males:females for the two samples. These findings reflect those reported in other studies.

78-000239 Goldburg, S. R. SEASONAL OVARIAN CYCLE OF THE TIDEWATER GOBY, /EUCYCLOGOBIUS NEWBERRYI/ (GOBIIDAE). Southwest. Nat. 22 (4): 557-562. 15 Oct. 1977. SFA 23(1)
[Dep. Zool., Whittier Coll., Whittier, CA 90608]

78-000240 Hubbs, C.; Bailey, H. H. EFFECTS CF TEMPERATURE ON THE TERMINATION OF BREEDING SEASON OF /MENIDIA AUDENS/. Southwest. Nat. 22 (4): 544-547. 15 Oct. 1977. SFA 23(1)
[Dep. Zool., Univ. Texas, Austin 78712]

78-000241 Hubert, W. A.; Mitchell, V. P., Jr. OBSERVATIONS ON THE OVARIAN DEVELOPMENT OF SMALLMOUTH BASS IN PICKWICK RESERVOIR. J. Ala. Acad. Sci. 48 (3): 65. July 1977. SFA 23(1)
Abstract only. The sexual maturity and seasonal ovarian development of 202 Pickwick Reservoir smallmouth bass were evaluated. A few fish were found to be sexually mature at three years, but most did not reach sexual maturity until their fourth year. Sexually mature smallmouth bass contained ova in several stages of development prior to spawning. Two distinct size groups were observed; only a portion of the largest size group became fully ripened at one time. Following the

78-000241 CONTINUED
spawning season residual ova were resorbed during the summer and renewed ova development was observed in September. Throughout the ova maturation process larger females were advanced over smaller, sexually mature fish. Smallmouth bass were found to produce larger ova, but a smaller number per unit of total length, than either the largemouth bass or spotted bass.

78-000242 Johnson, D. W.; Webster, D. A. AVOIDANCE OF LOW PH IN SELECTION OF SPAWNING SITES BY BROOK TROUT (/SALVELINUS FONTINALIS/). J. Fish. Res. Board Can. 34 (11): 2215-2218. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Nat. Resour., P.O. Box 67, Elkins, WV 26241]

78-000243 Olla, B. L.; Samet, C. COURTSHIP AND SPAWNING BEHAVIOR OF THE TAUTOG, /TAUTOGA ONITIS/ (PISCES: LABRIDAE), UNDER LABORATORY CONDITIONS. NOAA Fish. Bull. 75 (3): 585-599. July 1977. SFA 23(1)
[NMFS, Middle Atl. Coastal Fish. Cent., Highlands, NJ 07732]
Courtship and spawning behavior of the Tautog, /Tautoga onitis/, were observed under controlled laboratory conditions. Two separate groups of tautog, consisting of two males and one female, were each studied over an entire spawning season. The larger male of each group was dominant over the other two animals. This dominance was expressed during the spawning season by intensified aggression towards the subordinate male. The dominant male of each group, once reaching seasonal reproductive readiness, was the primary spawning partner of the female. Prior to the onset of spawning, a rapid approach of the dominant, formerly a component of an aggressive chase, functioned as a courtship behavior directed at the female. Each day the female exhibited dynamic and transient shading changes which became maximally developed as the time of each spawning approached in the afternoon. actual gamete release, which took place each day following 6 to 8 h of courtship, occurred as the dominant male and female moved upwards in synchrony and spawned near or at the surface. The significance of courtship and spawning in tautog is discussed and compared with reproductive behavior in other labrids.

78-000244 Rabin, D. J.; Barnhart, R. A. FECUNDITY OF PACIFIC HERRING, /CLUPEA HARENGUS PALLASI/, IN HUMBOLDT BAY. Calif. Fish Game 63 (3): 193-196. July 1977. SFA 23(1)
[Fish. Res. Inst., Univ. Wash., Seattle]

78-000245 Robertson, D. A. PLANKTONIC EGGS OF THE LANTERNFISH, /LAMPANYCTODES HECTORIS/ (FAMILY MYCTOPHIDAE). Deep-Sea Res. 24 (9): 849-852. Sept. 1977. SFA 23(1)
[Fish. Res. Div., Minist. Agric. Fish., Wellington, New Zealand]

78-000246 Shubnikov, D. A. TYPES OF MIGRATION CYCLES OF DIADROMOUS AND SEMIDIADROMOUS FISHES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 531-535. 1976. SFA 23(1)
[VNIRO, Moscow, USSR] The contemporary definitior of diadromous and semidiadromous fishes is critically examined. It is proposed to extend the notion of the group of semidiadromous fish by including fish living in brackish waters and reproducing in the sea, and also fish living in fresh and sea waters but reproducing in brackish water. Two types of migration cycles for diadromous fish and four types of migration cycles for semidiadromous fish are described.

78-000247 Stanley, C. A.; Malcolm, W. B. REPRODUCTIVE CYCLES IN THE EASTERN SUBSPECIES OF THE AUSTRALIAN SALMON, /ARRIPIS TRUTTA MARGINATA/ (CUVIER & VALENCIENNES). Aust. J. Mar. Freshwater Res. 28 (3): 287-301. June 1977. SFA 23(1)

[Div. Fish. Oceanogr., CSIRO, P.O. Box 21, Cronulla, N.S.W. 2230, Australia] To complement similar work carried out on the western subspecies of the Australian salmon (/Arripis trutta esper/), the known data on the reproductive cycle of the eastern subspecies (/A. t. marginata/) are summarized. The data (collected between 1961 and 1963) consisted of ovary and testis weights, fish lengths, oocyte diameters from preserved ovaries, and information from histological material. The gonad weight data were analysed to show increases in ovary and testis weights, which were indicative of sexual activity. Supporting information was extracted from changes in maximum oocyte diameters, and from examination of histological sections. The onset of sexual maturity for juvenile fish in Tasmanian waters occurred at a length of approximately 39 cm (equivalent to the end of the fourth year of life)

The corresponding length for the western subspecies is 54 cm (at approximately the same age), and 52-54 cm for New Zealand fish. There was no evidence of spawning activity in Tasmanian waters. Cycles of sexual activity were observed in fish from the Lakes Entrance area of Victoria and the Eden and Bermagui areas of scuthern New South Wales. Spawning activity was deduced to occur between December and January in the Lakes Entrance area, between January and February in the Eden area, and between November and February in the Bermagui area. Sexual maturation may ccmmence in males at a slightly younger age than in females.

78-000248 Thakur, N. K.; Sheel, M.; Nasar, S. A. K. SPAWNING BEHAVIOUR OF AN AIR-BREATHING CATFISH /HETEROPNEUSTES FOSSILIS/ (BLOCH). Physiol. Behav. 19 (1): 53-55. July 1977. SFA 23(1)

[I.C.A.R., Laheriasarai 846001, Darbhanga, Bihar, India] Spawning behaviour of /H. fossilis/ was studied by breeding the fish in laboratory through hypophysation using pituitary glands of the Indian major carps (/Catla catla/ and /Labeo rohita/) at a dose of about 15 mg/100 g body weight of the recipient. The spawning activity started about 6 to 10 hr after the administration of pituitary injection. The activity lasted 2 to 6 hr in various experiments. During this period, intermittent mating acts were observed, the average rate of mating being once every 2 to 3 min in the initial stages and 5 to 10 min or even longer in the later ones.

78-000249 Troitskiy, S. K.; Tsunikova, Ye. P. THE TIME OF SPAWNING MIGRATIONS AND SPAWNING OF THE PIKE-PERCH /LUCIOPERCA LUCIOPERCA/ IN THE AZOV-KUBAN REGION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 592-598. 1976. SFA 23(1)

[AzNIIRKh, Rostov-on-Don, USSR] Over a fifty-year period considerable changes were noted in the time of spawning migrations of the pike-perch, /Lucioperca lucioperca/, and of spawning times and duration, which were due to the curtailment of the range of the pike-perch in the Sea of Azov in connection with its salinization resulting from the reduced river flow.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

78-000250 Bailey, R. F. J.; Able, K. W.; Leggett, W. C. SEASONAL AND VERTICAL DISTRIBUTION AND GROWTH OF JUVENILE AND ADULT CAPELIN (/MALLOTUS VILLOSUS/) IN THE ST. LAWRENCE ESTUARY AND WESTERN GULF OF ST. LAWRENCE. J. Fish. Res. Board Can. 34 (11): 2030-2040. Nov. 1977. In English with French summ. SFA 23(1)
[W. C. Leggett: Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

78-000251 Davis, W. L.; Freeze, T. M. THE OCCURRENCE AND RELATIVE ABUNDANCE OF PLANKTONIC FISH LARVAE IN ANDERSON CREEK EMBAYMENT, KENTUCKY LAKE, KENTUCKY. Trans. Ky. Acad. Sci. 38 (3-4): 120-122. Sept. 1977. SFA 23(1)
[Dep. Biol. Sci., Murray State Univ., Murray, KY 42071] Larval fishes were collected from Anderson Creek embayment of Kentucky Lake with a 0.8-mm mesh plankton net and habitat seine to document the species of fishes utilizing the area as a spawning ground. The Clupeidae constituted 99.6 percent of the total catch while other species made up the remaining 0.4 percent. As the water temperature rose above 19.0 C, a sharp increase occurred in the total number of Clupeidae. The nonclupeid fishes were represented by /Morone/ sp. (above 17.0 C) and by /Pomoxis/ sp. (between 19.0 and 22.0 C).

78-000252 Edwards, R. J. SEASONAL MIGRATIONS OF /ASTYANAX MEXICANUS/ AS AN ADAPTATION TO NOVEL ENVIRONMENTS. Copeia 1977 (4): 770-771. 25 Nov. 1977. SFA 23(1)
[Dep. Zool., Univ. Texas, Austin 78712]

78-000253 Ezzat, A.; El-Serafy, S. THE MIGRATION OF ELVERS OF /ANGUILLA ANGUILLA/ L. IN THE MEX CANAL, ALEXANDRIA, EGYPT. J. Fish Biol. 11 (3): 249-256. Sept. 1977. SFA 23(1)
[Oceanogr. Dep., Fac. Sci., Alexandria Univ., Egypt] The run of elvers of /Anguilla anguilla/ (L) up the Mex canal, Alexandria, Egypt, starts at the end of February and continues until June, with the main bulk of elvers arriving in April and May. Variations in the timing of this run may be attributable to variations in local ecological conditions. The run is affected by meteorological and hydrographic factors. The effects of the latter have been assessed, and a low oxygen content, a pH between 7.7 and 8.0, a chloride content between 2.1 and 2.3 Cl/l and a temperature between 20 and 25°C have been found to encourage large numbers of elvers to migrate up the fresh water canal. In contrast to previous findings, the results of this study suggest that the mean length of elvers running increases towards the end of the season.

78-000254 Jacquaz, B.; Able, K. W.; Leggett, W. C. SEASONAL DISTRIBUTION, ABUNDANCE, AND GROWTH OF LARVAL CAPELIN (/MALLOTUS VILLOSUS/) IN THE ST. LAWRENCE ESTUARY AND NORTHWESTERN GULF OF ST. LAWRENCE. J. Fish. Res. Board Can. 34 (11): 2015-2029. Nov. 1977. In English with French summ. SFA 23(1)
[W. C. Leggett: Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

78-000255 Jellyman, D. J. SUMMER UPSTREAM MIGRATION OF JUVENILE FRESHWATER EELS IN NEW ZEALAND. N. Z. J. Mar. Freshwater Res. 11 (1): 61-71. Mar. 1977. SFA 23(1)

[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19-062, Wellington, New Zealand] Elvers, active at night or during overcast and damp days, surmount steep obstacles by climbing; they adhere to damp surfaces by friction and surface tension, obtaining maximum resistance by undulating their bodies and keeping them closely adpressed to the substrate. The maximum size for vertical climbing is 12 cm. As elvers were sampled at sites where their migration was interrupted, no distinct schools were observed, but the elvers were strongly social and thigmotactic. Migrations are made up of elvers of similar size of one or both species. In large river systems, elvers apparently migrate successively further upstream each year for several years. North Island samples contained elvers up to 3y of age, but in the South Island elvers up to 7y old were recorded; aging was by burnt otoliths. Migration is perhaps initiated by increases in water temperature, day length, and sociability; increased water flow may also coincide with 'runs'. Electric fishing of streams shows that the two species have different habitat preferences, and these are reflected in the proportion of elvers caught at different sites: longfins prefer swift stony rivers, shortfins silty backwaters and lakes, but both are often found together. Longfin elvers have thick dermal skin layers, and experiments in air of constant temperature and humidity showed that they cannot survive prolonged exposure requiring cutaneous respiration as well as shortfins; longfins may also have higher oxygen requirements.--From abstr.

78-000256 Rauck, G. TWO GERMAN PLAICE TAGGING EXPERIMENTS (1970) IN THE NORTH SEA. Arch. Fischereiwiss. 28 (1): 57-64. July 1977. In English with German summ. SFA 23(1)

[Inst. Kusten- und Binnenfischerei der Bundesforschungsanstalt fuer Fischerei, Hamburg, West Germany] In February-March 1970 670 plaice were tagged in area A (Schlickbank) and 338 in area B (off Terschelling). The return rate was 35.7 percent (A) and 26.8 percent (B). The highest return rate was always observed during the first quarter, when also the catch per fishing day was the highest compared to other quarters of the year. This is due to spawning aggregations of ripe plaice in this area. The plaice from the Schlickbank area (A) do not move too much during the whole year whereas the plaice from area B behave like the plaice of the inner German Bight (1969 tagging experiment). These plaice are moving into the Southern Bight and back into the German Bight. There is hardly any overlapping in the distribution pattern between the plaice of area A and B.

78-000257 Sciarrotta, T. C.; Nelson, D. R. DIEL BEHAVIOR OF THE BLUE SHARK, /PRIONACE GLAUCA/, NEAR SANTA CATALINA ISLAND, CALIFORNIA. NOAA Fish. Bull. 75 (3): 519-528. July 1977. SFA 23(1)

[South. Calif. Edison, Water Qual. Biol. Group, 2244 Walnut Grove Ave., Rosemead, CA 91770] The diel activity levels and movements of the blue shark, /Prionace glauca/, were studied in the natural environment using ultrasonic telemetry. Two initial sharks were tagged with single-channel transmitters equipped with depth sensors. Twelve sharks were tagged with multichannel transmitters with various combinations of sensors to measure depth, swimming speed, swimming direction, and temperature. From March to early June, the sharks made an evening-twilight migration from their epipelagic daytime habitat to the shallow waters bordering the island. From late June to October, the sharks remained offshore throughout the day and night. This change in movement pattern is suggested to be in response to a seasonal shift in location of prey. The telemetry data indicated that the blue shark

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is basically nocturnal, showing highest activity in the early evening and lowest activity in the early daylight morning. Measured parameters increasing at night included 1) rate of horizontal movement, 2) swimming speed, 3) variability in depth, and 4) variability in swiming direction. The sharks usually remained within a relatively narrow range of water temperatures.

FOODS AND FEEDING

78-000258 Bargmann, G. G. INSTANCES OF COPPER ROCKFISH CONSUMING A SPINY DOGFISH SHARK. Calif. Fish Game 63 (3): 192. July 1977. SFA 23(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-000259 Blake, B. F. FOOD AND FEEDING OF THE MORMYRID FISHES OF LAKE KAINJI, NIGERIA, WITH SPECIAL REFERENCE TO SEASONAL VARIATION AND INTERSPECIFIC DIFFERENCES. J. Fish Biol. 11 (4): 315-328. Oct. 1977. SFA 23(1)
[Dep. Zool., The University, Reading, England] The feeding habits of mormyrids from Lake Kainji, Nigeria, are discussed in relation to the decreased abundance of these fish since impoundment in 1968. Evidence is presented of both intra-specific seasonal variation in diet and inter-specific trophic divergence. These variable factors are discussed in relation to the degree of success achieved by certain species in the lake.

78-000260 De Silva, S. S.; Wijeyaratne, M. J. S. STUDIES ON THE BIOLOGY OF YOUNG GREY MULLET, /MUGIL CEPHALUS/ L. II. FOOD AND FEEDING. Aquaculture 12 (2): 157-167. Oct. 1977. SFA 23(1)
Dep. Zool., Vidyalankara Campus, Univ. Sri Lanka, Kelaniya, Sri Lanka] The food and feeding habits of mullet, 20-55 mm in length, from the coastal Negombo Lagoon (7° 10' N; 79° 50' E) were studied from November 1974 to October 1975. The feeding intensity, estimated as the number of food organisms found in stomachs per feeding individual, followed a seasonal pattern with the intensity increasing from April onward and reaching a peak during June-August. Over 80 percent of the individuals were found to feed throughout the year. The diet consisted of 18 genera of diatoms, eight genera of green algae, some desmids, six genera of blue-green algae and eight other food groups. No sand or detritus was found to occur in fish smaller than 25 mm in length, and the percentage occurrence of detritus and/or sand particles increased with increase in body length. Quantitatively and qualitatively, diatoms were the most predominant food items, accounting for more than 50 percent of the total diet. Although only one genus of Xanthophyceae was found to occur in the diet, its contribution was significant. /M. cephalus/ was found to show diurnal periodicity in feeding activity; peaks of activity occurred at dawn and around midday and were unrelated to the state of the tide. The significance of the nature of the diet and the occurrence of two peaks of feeding activity within a 24-h period is evaluated in the light of present knowledge of the food and feeding behaviour of /M. cephalus/ at various stages of growth, and the possibilities of polyculture with other herbivorous species is discussed briefly.

78-000261 Filippov, G. M. SOME DATA ON THE BIOLOGY OF THE BELUGA /HUSO HUSO/ FROM THE SOUTH-EASTERN PART OF THE CASPIAN SEA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 566-574. 1976. SFA 23(1)
[Turkmenian Dep. Cent. Sturgeon Fish. Res. Inst., Krasnovodsk, USSR] Data are presented on the size composition, distribution and food of the beluga in the south-eastern part of the Caspian Sea. The main food of the beluga of all size groups is fish, mainly gobies; the significance of the "common kilka" in the food of the beluga decreases as the beluga increases in size. By comparison with 1970, a decrease in the number of beluga from older age groups is noted.

78-000262 Foltz, J. W.; Norden, C. R. FOOD HABITS AND FEEDING CHRONOLOGY OF RAINBOW SMELT, /OSMERUS MORDAX/, IN LAKE MICHIGAN. NOAA Fish. Bull. 75 (3): 637-640. July 1977. SFA 23(1)
[Environ. Popul. Organ. Biol., Univ. Colo., Boulder 80309]

78-000263 Foster, J. R. PULSED GASTRIC LAVAGE: AN EFFICIENT METHOD OF REMOVING THE STOMACH CONTENTS OF LIVE FISH. Prog. Fish-Cult. 39 (4): 166-169. Oct. 1977. SFA 23(1)
[Dep. Zool., Univ toronto, Toronto, ON M5S 1A1, Canada]

78-000264 Gophen, M.; Landau, R. TROPHIC INTERACTIONS BETWEEN ZOOPLANKTON AND SARDINE /MIROGREX TERRAESANCTAE/ POPULATIONS IN LAKE KINNERIT, ISRAEL. Oikos 29 (1): 166-174. 1977. In English with Russian summ. SFA 23(1)
[Kinneret Limnol. Lab., Tiberias, Israel] Recent investigations in Lake Kinneret, Israel, indicated that physical, chemical and biological changes took place from 1973 onwards. The modifications observed in zoo-plankton populations were analysed and related to concomitant changes noted in the population of /Mirogrex terraesanctae/ (Kinneret sardine), which is the main predator of zooplankton. The cladocerans /Diaphanosoma/ sp., /Bosmina/ spp. and /Ceriodaphnia/ spp. were found to be preferential food sources for /Mirogrex/ when compared with Copepoda. In 1973 and in the first half of 1974, the biomass and productivity of Cladocera were higher (30 to 170 percent) than the average for 1969-1972. This was accompanied by a continual increase of purse-seine catch-per-unit-effort of sardine up to 1454 kg per boat-day during 1972-1976. Small and young /Mirogrex/ fishes were more frequent in the 1974-1975 catches than in previous seasons. The increase of the /Mirogrex/ population at the expense of the Cladocera caused a 26 percent decrease of productivity of the latter organisms compared to the interannual average (1969-1975). It also affected the age structure of the Copepoda population: the adult females became less abundant but they showed a higher fecundity.

78-000265 Hambrick, P. S.; Hibbs, R. G., Jr. FEEDING CHRONOLOGY AND FOOD HABITS OF THE BLACKTAIL SHINER, /NOTROPIS VENUSTUS/ (CYPRINIDAE), IN BAYOU SARA, LOUISIANA. Southwest. Nat. 22 (4): 511-516. 15 Oct. 1977. SFA 23(1)
[Mus. Zool., La. State Univ., Baton Rouge 70893] Blacktail shiners, /Notropis venustus/, were collected in Bayou Sara, West Feliciana Parish, Louisiana, every three hours over a 24-hour period on two different days (12-13 April and 27-28 June, 1975) to determine feeding chronology and food habits of this species. Peak feeding activity was just prior to sunset. Feeding was sporadic at night, lowest just prior to sunrise, and increased steadily after sunrise. /Notropis venustus/ is predominantly carnivorous. Terrestrial insects were the major food items. Feeding activity appeared to be a function of the availability

78-000265 CONTINUED
of food organisms.

78-000266 Iwata, K. MORPHOLOGICAL AND PHYSIOLOGICAL STUDIES ON THE PHYTOPLANKTON FEEDERS IN CYPRINID FISHES--I.--DEVELOPMENTAL CHANGES OF FEEDING ORGANS AND INGESTION RATES IN KAWACHIBUNA (/CARASSIUS AURATUS CUVIERI/), SILVER CARP (/HYPOPHTHALMICHTHYS MOLITRIX/) AND NIGOROBUNA (/C. AURATUS GRANDOCULIS/). Jpn. J. Limnol. 37 (4): 135-147. Oct. 1976. In Japanese with English summ. SFA 23(1)

78-000267 Jones, B. C.; Geen, G. H. FOOD AND FEEDING OF SPINY DOGFISH (/SQUALUS ACANTHIAS/) IN BRITISH COLUMBIA WATERS. J. Fish. Res. Board Can. 34 (11): 2067-2078. Nov. 1977. In English with French summ. SFA 23(1)
Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

78-000268 Kajak, Z.; Spodniewska, I.; Wisniewski, R. J. STUDIES ON FOOD SELECTIVITY OF SILVER CARP, /HYPOPHTALMICHTHYS MOLITRIX/ (VAL.). Ekol. Pol. 25 (2): 227-239. 1977. In English with Polish summ. SFA 23(1)
[Dep. Hydrobiol., Inst. Ecol., Polish Acad. Sci., near Warsaw, Poland] Experimental investigations on the feeding of silver carp were conducted in four Masurian lakes with different qualitative composition and biomass of plankton. Distinct food selectivity was observed as regards various groups of food (phytoplankton, zooplankton, detritus) and various phytoplankton species. Phytoplankton was the main food component of fish examined, even if its concentration was low. Some blue-green alge were not consumed by fish even when they dominated in phytoplankton; in cases where phytoplankton consisted of blue-green algae only the selectivity of zooplankton was higher. The pressure of silver carp on zooplankton seems often higher than on phytoplankton.

78-000269 Kislalioglu, M.; Gibson, R. N. THE FEEDING RELATIONSHIP OF SHALLOW WATER FISHES IN A SCOTTISH SEA LOCH. J. Fish Biol. 11 (3): 257-266. Sept. 1977. SFA 23(1)
[Dep. Life Sci., Middle East Tech. Univ., O.D.T.U., Ankara, Turkey] The diets of 24 species of inshore fish from Loch Etive in western Scotland were examined over the period October 1971-October 1972. The relative importance of each dietary constituent was determined by the points method and the division of food resources among the fish population assessed. Crustacea, and amphipods in particular, formed the bulk of the diet in nearly all fish. Most species relied mainly on two/three major types of food, the variation between the diets of individual species was caused by differing degrees of utilisation of the same food groups rather than feeding on entirely different groups. Considerable differences in diet were found between growth stages of the same species. The assemblage of species in the loch could be broadly divided into three groups, a benthic open sand-mud community, a community typical of areas with cover comprised of benthic and pelagic members, and a solely pelagic community. Finally, the degree of dietary overlap of the species investigated was compared with those of other marine fish communities.

78-000270 Macan, T. T. THE INFLUENCE OF PREDATION ON THE COMPOSITION OF FRESH-WATER ANIMAL COMMUNITIES. Biol. Rev. (Camb.) 52 (1): 45-70. Feb. 1977. SFA 23(1)
[Stevney, Outgate, Ambleside, Cumbria, LA22 3NH England]

78-000271 Markovtsev, V. G. THE FEEDING OF THE "USSURI SAWBELLY" /HEMICULTER LEUCISCULUS LUCIDUS/ IN LAKE KHANKA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 625-631. 1976. SFA 23(1)
[Dep. Ichthyol. Hydrobiol., Far Eastern Univ., Vladivostok, USSR] The annual, seasonal and daily dynamics of feeding of the "Ussuri sawbelly", /Hemiculter leucisculus lucidus/, in the southern part of Lake Khanka was examined. Its food spectrum includes 59 components both of animal and plant origin. The main groups are the lower crustaceans (18 species), insects (24 taxa) and algae (10 species).

78-000272 Matthews, W. J. INGESTION OF SAND BY THE DUSKYSTRIPE SHINER, /NOTROPIS PILSBRYI/ FOWLER. Southwest. Nat. 22 (4): 543-544. 15 Oct. 1977. SFA 23(1)
[Biol. Dep., Roanoke Coll., Salem, VA 24153]

78-000273 Merna, J. W. FOOD SELECTION BY WALLEYE FRY. Mich. Dep. Nat. Resour. Fish. Div. Fish. Res. Rep. No. 1847. 12p. 13 Sept. 1977. SFA 23(1)
[Mich. Dep. Nat. Resour., East Lansing] Plankton samples and walleye fry were collected from two rearing ponds during the first week of life of the fry. The ponds, borrow pits created in construction of Interstate 75, are located in Roscommon County, Michigan. Fry were stocked in the ponds on May 14, 1975, while in the yolk-sac stage, and were first sampled the following day. The fry collected ranged in size from a mean of 9.17 mm in the first collection to 9.56 mm at the end of one week. Pond 1 contained a mixed population of zooplankton, and the fry indicated a positive selection of /Bosmina/, but the selection was more a function of size than species. Pond 2 contained almost a monoculture of /Daphnia/, and as a result they were the dominant organism in the diet of the fry. The average size of the /Daphnia/ in the zooplankton population was significantly larger than the size in the diet of the fry. Apparently the fry were forced to seek the smaller individuals in the population.

78-000274 Moreno, C. A.; Osorio, H. H. BATHYMETRIC FOOD HABIT CHANGES IN THE ANTARCTIC FISH, /NOTOTHENIA GIBBERIFRONS/ LONNBERG. (PISCES: NOTOTHENIIDAE). Hydrobiologia 55 (2): 139-144. 18 Aug. 1977. SFA 23(1)
[Inst. Ecol., Univ. Austral de Chile, Box 567, Valdivia, Chile] The dietary composition of the antarctic fish /Notothenia gibberifrons/ Lonnberg in a depth gradient was studied, from sea level until 200 meters in South Bay, Doumer Island, West Antarctic. The diet of this species varied across the depth gradient. Stomachs from specimens captured between the surface and 100 m. depth usually contained mobile benthic organisms, principally Amphipods. Those from below 150 m. had eaten almost sesile benthic organisms, principally Bivalvia species. Specimens sampled in the layer between the above-mentioned levels contained a mixture of items, some corresponding to the upper and others to the lower sections. Based on the presented evidence the feeding pattern of this species is discussed.

78-000275 Moss, S. A. FEEDING MECHANISMS IN SHARKS. Am. Zool. 17 (2): 355-364. 1977. SFA 23(1)
[Biol. Dep., Southeast. Mass. Univ., North Dartmouth 02747] Although many sharks have a rather general vertebrate body plan, they display a number of specializations for feeding that belie the notion that they are "primitive." These specializations include a battery of highly developed exteroceptive systems such as vision, olfaction, acoustico-lateralis sense and electroreception; and a cranial morphology that has been molded into a number of functionally adaptive forms. The evolution of the high diversity of mechanical feeding systems in such a small group of vertebrates has probably been facilitated by the morphological simplicity of the basic feeding mechanism. The evolutionary pattern of shark feeding mechanisms is complex, there being several examples of both parallelism and convergence. A long-jawed, grasping form (similar to, but not identical with /Chlamydoselachus/) is here considered primitive. From a subsequent benthic sucking and grasping ancestor, similar in many respects to some living batoids, radiated crushing, ray-like forms; cutting, squaloid forms; and gouging, lamniform and carcharhiniform types. From the latter developed sucking and grasping, or crushing forms such as modern orectolobiforms, triakids and heterodontiform sharks. From several levels (primary crushing, secondary crushing and gouging) there emerged filter-feeding forms represented today by mobulids, rhiniodontids and cetorhinids.--From abstr.

78-000276 Neveu, A.; Thibault, M. COMPORTEMENT ALIMENTAIRE D'UNE POPULATION SAUVAGE DE TRUITES FARIO (/SALMO TRUTTA/ L.) DANS UN RUISSEAU DES PYRENEES ATLANTIQUES, LE LISSURAGA. [FEEDING BEHAVIOUR OF A WILD POPULATION OF FARIO TROUT (/SALMO TRUTTA/ L.) IN THE LISSURAGA, A STREAM IN PYRENEES ATLANTIQUES.] Ann. Hydrobiol. 8 (2): 111-128. 1977. In French with English summ. SFA 23(1)
[Ecol. Invert., Stn. Hydrobiol., I.N.R.A., BP 79, 64200 Biarritz, France] This study deals with feeding habits of 276 trouts (/Salmo trutta/ L.) caught during each season in the Lissuraga, a stream in the Pyrenees. The efficiency of the Seaburg stomach pump appears uncertain and depends on the present faunistic groups and the stomach size. The food composition varies according to the period and trout size. Small trout eat many /Ephemeroptera/, trout feed mainly on /Mollusca/ and /Trichoptera/. The consumption of aerial fauna increases progressively with age. If the mean number of preys per trout increases with the age, the number of preys per gram diminishes. The size of preys is related to the predator size; it has been possible to calculate this relation for three faunistic groups (/Ephemeroptera/, /Trichoptera/, /Mollusca/). Very often two adjacent age classes catch the same organism but at different stages. This seasonal specialization allows a diversification in feeding possibilities, a better utilization of the environment and a decrease in competition risks. Growth, gonad development and stoutness show seasonal variations directly related with the amount of food ingested. Trout in the Lissuraga do not seem to feed more particularly on the nocturnal endogenous drift.

78-000277 Popova, O. A.; Sytina, L. A. FOOD AND FEEDING RELATIONS OF EURASIAN PERCH (/PERCA FLUVIATILIS/) AND PIKEPERCH (/STIZOSTEDION LUCIOPERCA/) IN VARIOUS WATERS OF THE USSR. J. Fish. Res. Board Can. 34 (10): 1559-1570. Oct. 1977. In English with French summ. SFA 23(1)
[A. N. Severtzov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

78-000278 Potts, D. C. SUPPRESSION OF CORAL POPULATIONS BY FILAMENTOUS ALGAE WITHIN DAMSELFISH TERRITORIES. J. Exp. Mar. Biol. Ecol. 28 (3): 207-216. Aug. 1977. SFA 23(1)

[Dep. Environ. Biol., Res. Sch. Biol. Sci., Aust. Natl. Univ., Canberra City, Australia] Transplanted pieces of the coral /Acropora palifera/ Lamarck simulating colonies 2-4 years old were adversely affected by dense algal-sediment mats developed in response to reduced grazing pressures within territories of the damselfish /Dischistodus perspicillatus/ (Cuvier). Coral growth was initially prolonged in autumn, but was subsequently suppressed during winter and spring. There was heavy mortality only in mid-winter when corals died rapidly from the base. It is suggested that the algal mat caused the corals to expend energy to keep their surfaces clean, so that death followed the exhaustion of metabolic reserves during periods of minimum nutrient availability, and that the abundance of /D. perspicillatus/ is sufficient to explain the paucity of small /Acropora palifera/ colonies in an otherwise favourable habitat.

78-000279 Prejs, A.; Blaszczyk, M. RELATIONSHIPS BETWEEN FOOD AND CELLULASE ACTIVITY IN FRESHWATER FISHES. J. Fish Biol. 11 (5): 447-452. Nov. 1977. SFA 23(1)

[Dep. Hydrobiol., Inst. Zool., Univ. Warsaw, 00-046 Warszawa, Nowy Swiat 67, Poland] The food and cellulase activity of five cyprinid and one salmonid species were examined. All Cyprinidae species showed cellulase activity. No activity was found in pelagic /Coregonus albula/ (Salmonidae). Cellulase activity showed a positive correlation with the amount of highly processed plant detritus in the gut. No correlation was found between the activity level and the amount of fresh fragments of macrophytes and filamentous algae.

78-000280 Reddy, S. R. AN EMPIRICAL RELATIONSHIP BETWEEN THE PREY DENSITY AND PREDATORY EFFICIENCY OF /GAMBUSIA AFFINIS/. Experientia (Basel) 33 (10): 1321-1323. 15 Oct. 1977. SFA 23(1)

[Dep. Zool., Bangalore Univ., Bangalore 560001, India] Larval density of /Culex fatigans/ essentially influences the predatory rate of the mosquito-fish /Gambusia affinis/. The feeding rate of the fish gradually increases up to a maximum value at intermediate prey densities beyond which there is an asymptotic saturation in the feeding rate. The relationship is represented by an empirical equation which helps in the prediction of the ideal stocking rate of the fish in natural systems.

78-000281 Reddy, S. R.; Shakuntala, K.; Rajagopal, K. V. PRELIMINARY STUDIES ON THE CONVERSION OF /TUBIFEX TUBIFEX/ AS FOOD BY ELVERS OF /ANGUILLA NEBULOSA/ (GRAY AND HARDWICKE). J. Fish Biol. 11 (3): 279-281. Sept. 1977. SFA 23(1)

[Fish. Biol. Sect., Dep. Zool., Bangalore Univ., Bangalore 560001, India] Elvers of /Anguilla nebulosa/ were reared at 23°C in confined waters and their food intake, growth and conversion efficiency (/K/(1) :percent) were studied. Elvers weighing 278.33±14.35 mg were fed on an /ad libitum/ diet of the oligochaete worm /Tubifex tubifex/ for 60 days. On an average, the test individuals consumed 99.55±19.81 mg food/elver/day amounting to 35.76 percent of the initial biomass; during the corresponding period the elvers exhibited a growth rate of 5.03±2.42 mg gain in weight/elver/day which is equivalent to 5.06 percent of the consumed food. Thus the 'housekeeping' of these elvers may be regarded as established. In 50 days, the food required amounts to 0.358X50=17.90 times the initially stocked biomass. That is, 1 kg of initially stocked elvers may need 17.90 kg of /T. tubifex/ to produce 0.912 kg of elver meat. A poor conversion ratio of 20:1 may be

78-000281 CONTINUED
one reason for the slow growth of the elvers.

78-000282 Robotham, P. W. J. FEEDING HABITS AND DIET IN TWO POPULATIONS OF SPINED LOACH, /COBITIS TAENIA/ (L.). Freshwater Biol. 7 (5): 469-477. Oct. 1977. SFA 23(1)

[Dep. Zool., Westfield Coll., Univ. London, England] The feeding habits of /Cobitis taenia/ were studied by means of monthly samples taken over a 2-year period, October 1972-October 1974, from two sites, one on the River Great Ouse at Newport Pagnell and the other at some neighbouring gravel pits. Dietary components, seasonal variation in these components, and seasonal and diurnal variation in feeding intensity were examined. The ecological niche of the food items and their size range are discussed, since both these factors appeared important in governing the microhabitat of the fish. The feeding activity followed a seasonal cycle with little or no feeding in the winter and a high level of feeding activity in mid-summer. The diet showed a predominance of small food items, such as chydorids, copepods and rhizopods. These items varied in occurrence during the feeding period which appeared to be related to their own abundance, pointing to non-selective feeding by the fish. The small size and benthic habits of the food items, many of which are closely associated with surface layers of mud and weed, indicated a preference by /Cobitis taenia/ (L.) for feeding in this type of habitat and on this type of food, in contrast to the stone loach, /Noemacheilus barbatulus/ (L.), which is believed to inhabit stony areas and take larger food items.

78-000283 Scura, E. D.; Jerde, C. W. VARIOUS SPECIES OF PHYTOPLANKTON AS FOOD FOR LARVAL NORTHERN ANCHOVY, /ENGRAULIS MORDAX/, AND RELATIVE NUTRITIONAL VALUE OF THE DINOFLAGELLATES /GYMNODINUM SPLENDENS/ AND /GONYAULAX POLYEDRA/. NOAA Fish. Bull. 75 (3): 577-583. July 1977. SFA 23(1)

[NMFS, P.O. Box 271, La Jolla, CA 92038] First feeding northern anchovy larvae were presented with a variety of phytoplankters common to coastal waters of southern California to determine which species are acceptable as food. Most of the larvae ate the four species of dinoflagellates tested in feeding experiments but did not feed on diatoms or small flagellates. Larval rearing experiments were conducted to compare the nutritional value of /Gymnodinium splendens/ and /Gonyaulax polyedra/, two species of dinoflagellates readily eaten by anchovy larvae and known to predominate in the chlorphyll maximum layers off the southern coast. /Gymnodinium splendens/ was a nutritional food for the first 10 days of larval life, but /Gonyaulax polyedra/ was judged to be inadequate. Supplementing the /G. polyedra/ diet with microzooplankton increased larval survival comparable to survival on a microzooplankton diet alone. When the /Gymnodinium splendens/ diet was supplemented with microzooplankton, the larvae grew faster but survival did not increase. Results are discussed in relation to studies on larval survival in the Southern California Bight during 1974 and 1975.

78-000284 Smith, T. G. THE WOLFFISH, CF. /ANARHICHAS DENTICULATUS/, NEW TO THE AMUNDSEN GULF AREA, NORTHWEST TERRITORIES, AND A PROBABLE PREY OF THE RINGED SEAL. Can. Field-Nat. 91 (3): 288. July-Sept. 1977. SFA 23(1)

[Fish. Mar. Serv., P.O. Box 400, Ste-Anne-de-Bellevue, PQ H9X 3L6, Canada]

78-000285 Spanovskaya, V. D.; Grygorash, V. A. DEVELOPMENT AND FOOD OF AGE-0 EURASIAN PERCH (/PERCA FLUVIATILIS/) IN RESERVOIRS NEAR MOSCOW, USSR. J. Fish. Res. Board Can. 34 (10): 1551-1558. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Ichthyol., Moscow State Univ., USSR]

78-000286 Swenson, W. A. FOOD CONSUMPTION OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND SAUGER (/S. CANADENSE/) IN RELATION TO FOOD AVAILABILITY AND PHYSICAL CONDITIONS IN LAKE OF THE WOODS, MINNESOTA, SHAGAWA LAKE, AND WESTERN LAKE SUPERIOR. J. Fish. Res. Board Can. 34 (10): 1643-1654. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Univ. Wis., Superior 54880]

78-000287 Van Dyke, J. M.; Sutton, D. L. DIGESTION OF DUCKWEED (/LEMNA/ SPP.) BY THE GRASS CARP (/CTENOPHARYNGODON IDELLA/). J. Fish Biol. 11 (3): 273-278. Sept. 1977. SFA 23(1)
[Fla. Dep. Nat. Resour., Bur. Aquatic Plant Control, Tallahassee] A feeding trial was conducted in 55-l aquaria indoors with the grass carp (/Ctenopharyngodon idella/ Val.) using fresh duckweed (/Lemna/ spp.) as food. Faeces dry weight was closely correlated with dry weight of duckweed consumed based upon a linear regression. From this regression, the estimated true digestibility of dry matter was 65 percent. Samples of duckweed and fish faeces were analysed for crude protein and gross energy. Van Soest's Analysis was conducted on composite samples of duckweed and faeces. Apparent digestibilities were 80 percent for crude protein, 61 percent for gross energy, 72 percent for organic cell contents, and 30 percent for organic cell wall constituents.

78-000288 Vivekanandan, E. SURFACING ACTIVITY AND FOOD UTILISATION IN THE OBLIGATORY AIR-BREATHING FISH /OPHIOCEPHALUS STRIATUS/ AS A FUNCTION OF BODY WEIGHT. Hydrobiologia 55 (2): 99-112. 18 Aug. 1977. SFA 23(1)
[Cent. Mar. Fish. Res. Inst., Post Bag 1912, COCHIN-682018, India]

78-000289 Zahl, P. A.; McLaughlin, J. J. A.; Gomprecht, R. J. VISUAL VERSATILITY AND FEEDING OF THE FOUR-EYED FISHES, /ANABLEPS/. Copeia 1977 (4): 791-793. 25 Nov. 1977. SFA 23(1)
[Div. Biol. Sci., Fordham Univ., New York, NY 10458]

AGE AND GROWTH

78-000290 Allegret, P.; Denis, C.; Le Lannic, J. OBTENTION, AU LABORATOIRE, DE TAUX DE CROISSANCE ELEVES CHEZ LES AMMOCETES DE /LAMPETRA PLANERI/ (BLOCH) PAR UNE NOUVELLE METHODE D'ALIMENTATION. COMPARAISON AVEC LES CROISSANCES NATURELLES. [A NEW WAY OF LABORATORY BREEDING OF THE AMMOCOETES OF /LAMPETRA PLANERI/ BLOCH. COMPARISON BETWEEN BOTH THE EXPERIMENTAL AND NATURAL RATES OF GROWTH.] Ann. Hydrobiol. 8 (2): 255-262. 1977. In French with English summ. SFA 23(1)
[Lab. Biol. Anim. Cycle, Univ. Rennes, Complexe Beaulieu, Ave. General-Leclerc, 35031 Rennes Cedex, France] The ammocoetes of the lamprey of Planer were efficiently fed from the microorganisms, bacterial material, alga, protozoa which spead plenty into the breedings of some larva of Trichoptera which eat up green vegetables. Feeding and growth of the ammocoetes depend of the alimentary activity

78-000290 CONTINUED
of the larva of the Trichoptera which is indespensable to the swarming of the microorganisms. In good experimental conditions, the ammocoetes show rates of growth considerably higher than those noticed in the nature. The importance of trophic factors on the duration of the larval cycles of the ammocoetes is noticed.

78-000291 Arnoldi, D. C.; Herke, W. H.; Clairain, E. J., Jr. ESTIMATE OF GROWTH RATE AND LENGTH OF STAY IN A MARSH NURSERY OF JUVENILE ATLANTIC CROAKER, /MICROPOGON UNDULATUS/ (LINNAEUS), "SANDBLASTED" WITH FLUORESCENT PIGMENTS. Proc. Gulf Caribb. Fish. Inst. 26: 158-172. 1973[1974].
[La. Coop. Fish. Res. Unit, La. State Univ., Baton Rouge 70803]
Atlantic croaker constitute over half the industrial bottomfish landings from the Gulf of Mexico. Most length frequency studies indicate their mean standard length at 1 year of age does not exceed 130 mm but two recent papers dispute this. Project objectives were to determine juvenile croaker growth rates in the marsh and how long they remain there. About 90,000 croaker, from 10 to 40 mm standard length, were "sandblasted" with fluorescent pigment, and released, as they entered a marsh nursery. Recapture attempts were by trawling in the nursery and trapping at the outlet. Sixty definitely marked croaker were recaptured. These meager returns suggest individual croaker remain in the marsh only 1 to 4 months and grow about 14 mm per month. Croaker in industrial bottomfish landings generally range from 80 to 160mm; thus most may be less than 12 months old. Also, turnover rate of croaker using the marsh may be high enough to make the industry dependent on maintenance of a viable marsh nursery.

78-000292 Bailey, R. F. J.; Able, K. W.; Leggett, W. C. EVIDENCE FOR THE PRESENCE OF A METAMORPHIC CHECK IN CAPELIN (/MALLOTUS VILLOSUS/) OTOLITHS AND IMPLICATIONS FOR AGE DETERMINATION. J. Fish. Res. Board Can. 34 (11): 2008-2014. Nov. 1977. In English with French summ. SFA 23(1)
[W. C. Leggett: Dep. Biol., McGill Univ., Montreal, PQ H3A 1B, Canada]

78-000293 Belyaev, V. I. RELATIONSHIP BETWEEN LENGTH, WEIGHT, AND ADJUSTED BODY WEIGHT IN CARP LARVAE IN A SPAWNING POND. Sov. J. Ecol. (Engl. Transl. Ekologiya) 7 (6): 565-567. Nov.-Dec. 1977. SFA 23(1)

78-000294 Bryant, G. L. FECUNDITY AND GROWTH OF THE TULE PERCH, /HYSTEROCARPUS TRASKI/, IN THE LOWER SACRAMENTO-SAN JOAQUIN DELTA. Calif. Fish Game 63 (3): 140-156. July 1977. SFA 23(1)
[Bur. Reclamation, P.O. Box 427, Boulder City, NV 89005]
/Hysterocarpus traski/ were collected at the Bureau of Reclamation's fish screen near Tracy, California, from September 1972 to November 1973. Additional specimens were borrowed from the California Academy of Sciences. The testes and ovaries of 130 fish were examined. Sexual maturation of gonads is cyclic. The males are sexually mature during the breeding season, May to late October. The ova of the females, through the mechanism of delyed fertilization, are not fertilized until mid-January. Gestation takes 3.5 months. The average number of young is 47.4. The young tule perch are not born sexually mature, but reach maturity within a few weeks. A female may be inseminated within weeks of her birth and will become pregnant in January.

78-000295 Dipper, F. A.; Bridges, C. R.; Menz, A. AGE, GROWTH AND FEEDING IN THE BALLAN WRASSE /LABRUS BERGYLTA/ ASCANIUS 1767. J. Fish Biol. 11 (2): 105-120. Aug. 1977. SFA 23(1)

[Dep. Mar. Biol., Univ. Liverpool, Port Erin, Isle of Man] A study of the age, growth and feeding of the protcgynous wrasse /Labrus bergylta/ (Teleostei: Labridae) was made on 25 male and 316 female specimens taken from the southern coasts of the Isle of Man from October 1972 to October 1974. Age determination and back-calculations for length were made from the opercular bones. The oldest male and female specimens were 29 and 25 years old respectively. The growth curves showed only a slight increase in growth rate after sexual inversion, and a pattern of slcw irregular increase, with no pronounced leveling off in old fish. The time of sexual inversion varied widely: intersexual specimens of 5 and 14 years were found. The youngest functional male was 6 years old. The weight/length relationships of males and females were very similar and the following equation, derived from all individuals, was used to calculate weights for age utilizing the back-calculated lengths: log /W/ = -5.354+3.2107 log /L/. The mouth, pharyngeal teeth and gut length to fish length ratio (0.622) suggested an omnivorous diet. Analysis of gut contents confirmed this, with decapod crustacea, isopods and molluscs the dominant food items. There were seascnal changes in feeding intensity and composition of the diet, related to temperature changes, onshore-offshore migration patterns, availability of food items, and changes in habitat associated with maturation.

78-000296 Fortin, R.; Fournier, P. AGE ET CROISSANCE DES PERCHAUDES (/PERCA FLAVESCENS/ MITCHILL) DU LAC BEAUCHAMP, SAINT-DONAT, QUEBEC. [AGE AND GROWTH OF THE YELLOW PERCH (/PERCA FLAVESCENS/ MITCHILL) OF LAKE BEAUCHAMP, SAINT-DONAT, QUEBEC.] Nat. Can. (Que.) 104 (3): 223-227. May-June 1977. In French with English summ. SFA 23(1)

[Dep. Sci. Biol., Univ Montreal, Montreal, PQ, Canada] An age and growth study has shown that lake Beauchamp contained mostly stunted perch. However, a few very large, fast growing individuals were also found in this population, most of them female. These two groups of fishes differ as much as the fastest and slowest growing perch populations yet studied in Quebec.

78-000297 Freeze, T. M.; Tatum, B. COMPARATIVE AGE, GROWTH, AND CONDITION OF CHANNEL CATFISH FROM LAKE DARDANELLE, ARKANSAS. Trans. Ky. Acad. Sci. 38 (3-4): 123-127. Sept. 1977. SFA 23(1)

[Dep. Biol. Sci., Murray State Univ., Murray, KY 42071] Pectoral spines were collected from 112 channel catfish /Ictalurus punctatus/ from Lake Dardanelle, Arkansas, during 1973-1975 for purposes of calculating age and growth of different year classes. A length-weight relationship, determined using the equation log W = -4.3297 + 2.7216 log L, indicated that an average channel catfish from Lake Dardanelle weighs about 165 g when it reaches a harvestatel size of 225 mm. Lake Dardanelle channel catfish were characterized by a large first year's growth with greater lengths similar to those from nearby states. Condition factors tended to decrease with increased age.

78-000298 Go, Y. B.; Kawaguchi, K.; Kusaka, T. ECOLOGIC STUDY ON /DIAPHUS SUBORBITALIS/ WEBER (PISCES, MYCTOPHIDAE) IN SURUGA BAY, JAPAN--I. METHOD OF AGING AND ITS LIFE SPAN. Bull. Jpn. Soc. Sci. Fish. 43 (8): 913-919. Aug. 1977. SFA 23(1)
[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo, Japan] An ecologic study of a myctophid fish /Diaphus suborbitalis/ has been made to find out the prey-predator relationship between this fish and the commercially important sergestid shrimp in Suruga Bay. This paper describes the method of determining the age of individual fish as a preliminary to describing age structure and composition of the stock. Sampling was made at night by Isaacs Kidd midwater trawl and shrimp net, from September 1974 to July 1975, usually at monthly intervals. As a result of otolith ring analysis, the transparent ring was proved to be formed during summer and winter, and the opaque ring during spring and early summer. A pair of these two rings occurs once a year and corresponds to one year of age. Maximum age of this species is estimated to be at least 2.5 years. The relationship between the standard length of body and the radius of the otolith is linear. Standard length backcalculated, using the above linear relationship, is usually underestimated, indicating the presence of Lee's phenomenon.

78-000299 Griffin, J. M.; Godfrey, R. L. NOVEL METHOD OF PROJECTION FOR THE EXAMINATION OF FISH SCALES. Prog. Fish-Cult. 39 (4): 165. Oct. 1977. SFA 23(1)
[Southwest. Tech. Inst., Sylva, NC 28779]

78-000300 Kaakinen, R.; Valtonen, T. THE BODY-SCALE LENGTH RELATION ON THE OULU RIVER POPULATION OF /COREGONUS LAVARETUS/ (LINNE) S.STR. Rep. Inst. Freshwater Res. Drottingholm No. 55. p. 38-44. 1976. SFA 23(1)
[Perameri Res. Stn., Univ. Oulu, SF-90 100 Oulu, Finland]

78-000301 Kitchell, J. F.; Stewart, D. J.; Weininger, D. APPLICATIONS OF A BIOENERGETICS MODEL TO YELLOW PERCH (/PERCA FLAVESCENS/) AND WALLEYE (/STIZOSTEDION VITREUM VITREUM/). J. Fish. Res. Board Can. 34 (10): 1922-1935. Oct. 1977. In English with French summ. SFA 23(1)
[Lab. Limnol., Univ. Wis., Madison 53706]

78-000302 Magnin, E.; Fradette, C. CROISSANCE ET REGIME ALIMENTAIRE DE LA LOTTE /LOTA LOTA/ (LINNAEUS 1758) DANS DIVERS LACS ET RIVIERES DU QUEBEC. [GROWTH AND DIET OF THE BURBUT /LOTA LOTA/ (LINNAEUS 1758) IN SEVERAL QUEBEC LAKES AND RIVERS.] Nat. Can. (Que.) 104 (3): 207-222. May-June 1977. In French with English summ. SFA 23(1)
[Dep. Sci. Biol., Univ. Montreal, Montreal, PQ, Canada] the 262 burbot (/Lota lota/) specimens, on which this study was carried out, all originated from drainage basins located in the province of Quebec, between the 45°N and 53°N. At the age-group V, the burbots of des Deux-Montagnes (45°N) and Saint-Louis (45°N) lakes and of the La Grande Riviere River basin (53°N) respectively measure 38, 40 and 34 cm and weight 420, 460 and 200 g. In the first two habitats, specimens older than 7 years were limited in number while in the La Grande Riviere River basin most of them were between 8 and 12 years old. In the other drainage basins, the rate of growth seems to vary a lot, but due to the small amount of burbots caught, no significant comparisons were possible. Burbots feed on fishes and benthic invertebrates. The results of this study were compared to those of North Americans and Russians authors.

78-000303 Mahon, R. AGE AND FECUNDITY OF THE TADPOLE MADTOM, /NOTURUS GYRINUS/, ON LONG POINT, LAKE ERIE. Can. Field-Nat. 91 (3): 292-294. July-Sept. 1977. SFA 23(1)

[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Specimens collected from lagoons on Long Point, Lake Erie, in May and August, belonged to ages 1+, 2+, and 3+, as determined from vertebrae. The relationship of Log Fecundity = 1.918 log SL -0.148 log EW -1.750, where SL is standard length and EW is mean weight of one egg, was found for 33 ripe females collected in May.

78-000304 Neuman, E. THE GROWTH AND YEAR-CLASS STRENGTH OF PERCH (/PERCA FLUVIATILIS/ L.) IN SOME BALTIC ARCHIPELAGOES, WITH SPECIAL REFERENCE TO TEMPERATURE. Rep. Inst. Freshwater Res. Drottningholm No. 55. p. 51-70. 1976. SFA 23(1)

[Res. Lab., Natl. Swedish Environ. Prot. Board, S-740 71 Oregrund, Sweden] The effect of natural temperature variations on the yearly length increment and year-class strength of perch was studied in three areas along the Baltic coast of Sweden. From 1963-70 operculae from about 200 perch from each area were sampled yearly for age determination and back calculation of growth. The relative strengths of year classes were calculated from the age composition of catches. 1. The three areas were found to be almost identical as regards mean growth rate, variation of growth between years and variation between the relative strengths of year classes. 2. The mean annual growth was found to be positively correlated to the water temperature in August for the second year of life and to that in September for the adults. There is no significant correlation for the first year. 3. The strengths of year classes showed covariation with both the water and the air temperature in July and August. 4. The year-to-year variation in growth and its dependence on temperature increased markedly with age. 5. The correlation between growth and temperature dropped below the level of significance if the mean values of year classes were replaced by the length increments of single individuals in the analysis. 6. The individual dispersion was so large that, even in a year with a markedly good or markedly bad growth for the year class as a whole, from one-tenth to one-third of the individuals may differ to the opposite extreme. 7. Individual deviations from the mean value of a year class seldom occur in the same direction more than two years in succession. 8. Individual growths often tended to differ in the same direction for two consecutive years. This tendency was much more pronounced if the two years were similar as regards the mean growth of the year class.--Summ.

78-000305 Verdon, R.; Magnin, E. CROISSANCE EN LONGUEUR DU MEUNIER NOIR /CATOSTOMUS COMMERSONI COMMERSONI/ (LACEPEDE) DU LAC CROCHE DANS LES LAURENTIDES, QUEBEC. [GROWTH IN LENGTH OF THE WHITE SUCKER /CATOSTOMUS COMMERSONI COMMERSONI/ (LACEPEDE) OF LAKE CROCHE IN THE LAURENTIANS, QUEBEC.] Nat. Can. (Que.) 104 (3): 187-195. May-June 1977. In French with English summ. SFA 23(1)

[Dep. Sci. Biol., Univ. Montreal, Montreal, PQ Canada] The age of 760 /Catostomus commersoni/ was determined from sections of their pectoral fin rays. Several details of the growth of Lake Croche white suckers are described: differences in the growth of males and females, seasonal growth of different age groups from May to November, factors influencing young of the year growth, effects of tagging on growth.

78-000306 Vooren, C. M. GROWTH AND MORTALITY OF TARAKIHI (PISCES: CHEILODACTYLIDAE) IN LIGHTLY EXPLOITED POPULATIONS. N.Z. J. Mar. Freshwater Res. 11 (1): 1-22. Mar. 1977. SFA 23(1)
[CARMABI, Curacao, Netherlands Antilles] The lightly exploited populations of tarakihi /Cheilodactylus macropterus/ off the west coast of the South Island and off the Chatham Islands were sampled for age and growth in 1971 and 1972. The lengths-at-capture showed similar growth curves in both areas, a major feature being a rapid decline in annual length increment after year 10 (mean length at that age is 38-39 cm). Both populations contained a large proportion of fish older than 10y. A rapid decline in annual length increment after year 10 has not been observed in the heavily fished tarakihi stock off East Cape and may be characteristic of lightly exploited populations. The age composition of the Chatham Islands tarakihi indicated that this stock has been subject to fluctuations in recruitment and that /M/ was of the order of 0.08. In the lightly fished stock off the west coast of the South Island, /Z/ was approximately 0.13 so /F/ was there possibly of the order of 0.05 (/Z/, /F/, and /M/ are the instantaneous rates of total, fishing, and natural mortality respectively).

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

78-000307 Anderson, C. P.; Erickson, J. E.; Ross, J.; Undershill, J. C. REVISED DISTRIBUTION RECORDS OF SOME MINNESOTA FISHES. J. Minn. Acad. Sci. 43 (2): 3-6. 1977. SFA 23(1)
[Dep. Zool., Univ. Minn., Minneapolis] Recent collections of fishes from Minnesota have resulted in the addition of one species, /Fundulus sciadicus/ (Cyprinodontidae), to the state's inland faunal list. Additional information on the distribution of 12 other species (/Notropis topeka/, /Notropis spilopterus/, /Ictiobus cyprinellus/, /Carpiodes cyprinus/, /Moxostoma valenciennesi/, /Notorus flavus/, /Morone chrysops/, /Lepomis megalotis/, /Stizostedion canadense/, /Percina shumardi/, /Etheostoma caeruleum/, and /Cottus bairdi/) is presented. These new records are the result of field work in the Missouri River, Red River, and Lake Superior drainage systems of Minnesota.

78-000308 Barker, J. L.; Kulp, K. P. LIMNOLOGICAL SURVEY OF SACONY CREEK BASIN, BERKS COUNTY PENNSYLVANIA. U.S. Geol. Surv. Water Res. Div. No. USGS/WRI 76-84. 45p. Aug. 1976. SFA 23(1)
[U.S.G.S., Water Res. Div., 228 Walnut St., P.O. Box 1107, Harrisburg, PA 17108]

78-000309 Best, E. A. DISTRIBUTION AND ABUNDANCE OF JUVENILE HALIBUT IN THE SOUTHEASTERN BERING SEA. Int. Pac. Halibut Comm. Sci. Rep. No. 62. 23p. 1977. SFA 23(1)
[Int. Pac. Halibut Comm., P.O. Box 5009, University Station, Seattle, WA 98105] The southeastern Bering Sea is a vast nursery area for halibut. The International Pacific Halibut Commission (IPHC) has studied the juveniles inhabiting this area since 1963. These fish move to the shallow flats during the summer and return to deeper water during winter. This seasonal movement has become less extensive with a measurable cooling trend observed in recent years. Relative abundance, size composition, Growth, and mortality changed during the period of study. The abundance of juveniles varied inversely with the estimates of incidental catch of halibut by the trawl fishery. The abundance index declined from 31.0 in 1966 to 3.1 in 1972 but has increased consistently in recent years to 18.9 in 1977. Differing environmental

78-000309 CONTINUED
conditions and changes in the abundance of the spawning stock also may have affected the strength of year classes. The interchange of halibut between the Bering Sea and Gulf of Alaska is discussed.

78-000310 Bisson, P. A. OCCURRENCE OF THE SHORTHEAD SCULPIN, /COTTUS CONFUSUS/, IN A HEADWATER TRIBUTARY OF DESCHUTES RIVER, WASHINGTON. Northwest Sci. 51 (1): 43-45. Feb. 1977. SFA 23(1)
[Weyerhaeuser Co., Longview, WA 98632] Five specimens of the shorthead sculpin (/Cottus confusus/) have been collected from Hard Creek, a cold-water tributary of the upper Deschutes River in western Washington. They represent the first recorded occurrence of this species from a southern Puget Sound river system, and their presence above the barrier falls of Deschutes River suggests that the shorthead sculpin invaded the Puget Sound region earlier than had previously been believed.

78-000311 Duffy, J. M. SOUTHERN RANGE EXTENSIONS FOR CHUM AND SOCKEYE SALMON, /ONCORHYNCHUS KETA/ AND /O. NERKA/. Calif. Fish Game 63 (3): 196-199. July 1977. SFA 23(1)
[Mar. Resour. Reg., Calif. Dep. Fish Game, San Diego 92101]

78-000312 Fursa, T. I. INVESTIGATIONS OF FISH PLANKTON OFF THE WEST COAST OF HINDUSTAN DURING THE PERIOD OF THE SUMMER MONSOON. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 668-672. 1976. SFA 23(1)
[AzCherNIRO, Kerch, USSR] In August 1971 the number of fish eggs and larvae was greater in the northern part of the region (along 18°N) than in the southern part. In the northern region 23.4 eggs and 17.7 larvae per 100 m^3 were noted and on the south-west ccast of India 9.1 and 7.1 per 100 m^3 respectively. The larvae of fish belonging to 27 families were recorded in the plankton. The larvae of /Vinciguerria numbaria/, Myctophidae and Carangidae were most commcn.--Ccncl.

78-000313 Futch, C. R.; Dwinell, S. E. NEARSHORE MARINE ECOLOGY AT HUTCHINSON ISLAND, FLORIDA: 1971-1974. IV. LANCELETS AND FISHES. Fla. Mar. Res. Publ. No. 24. 23p. May 1977. SFA 23(1)
[Fla. Dep. Nat. Resour., Mar. Res. Lab., 100 8th Ave. SE, St. Petersburg 33701]

78-000314 Gibson, R. J.; Sears, R. AN OCCURRENCE OF /FUNDULUS DIAPHANUS/ (LESUEUR) ON THE NORTH SHORE OF THE GULF OF ST. LAWRENCE. Nat. Can. (Que.) 104 (3): 273-274. May-June 1977. In English with French summ. SFA 23(1)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543] /Fundulus diaphanus/ was fcund in a shallow lake on the coast close to the Matamek River (50°18'N and 65°57'W) during August 1976. This is the first time the species has been reported from the Ncrth Shcre of the Gulf of St. Lawrence, and makes a slight northern extension of its known range.

78-000315 Gordon, J. D. M. THE FISH POPULATIONS OF INSHORE WATERS OF THE WEST COAST OF SCOTLAND. THE UNUSUAL OCCURRENCE OF THE BLUE WHITING (/MICROMESISTIUS POUTASSOU/) AND SOME NOTES ON ITS BIOLOGY. J. Fish Biol. 11 (2): 121-124. Aug. 1977. SFA 23(1)
[Dunstaffnage Mar. Res. Lab., P.O. Box No. 3, Oban, Argyll, Scotland] This paper records the unusual occurrence of the blue whiting (/Micromesistius poutassou/) from inshore waters of the west coast of Scotland from 1971 to 1974. The fish were 0 and I-group and appeared to migrate into the area during the autumn and winter months. Data on growth, length for weight relationships and feeding are described.

78-000316 Gray, R. H.; Dauble, D. D. CHECKLIST AND RELATIVE ABUNDANCE OF FISH SPECIES FROM THE HANFORD REACH OF THE COLUMBIA RIVER. Northwest Sci. 51 (3): 208-215. Aug. 1977.
[Freshwater Sci. Ecosyst. Dep., Battelle Pac. Northwest Lab., Richland, WA 99352]

78-000317 Gushima, K.; Murakami, Y. [SPECIES COMPOSITION OF THE REEF FISHES AT HONMURA BAY OF KUCHIERABU ISLAND.] J. Fac. Fish. Anim. Husb. Hiroshima Univ. 16 (1): 107-114. Aug. 1977. In Japanese with English summ. SFA 23(1)
[Dep. Fish., Hiroshima Univ., Japan]

78-000318 Haedrich, R. L. A SEA LAMPREY FROM THE DEEP OCEAN. Copeia 1977 (4): 767-768. 25 Nov. 1977. SFA 23(1)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

78-000319 Hatch, J. T.; Clark, B. F. /MORONE CHRYSOPS/ (RAFINESQUE): THE WHITE BASS IN LAKE SUPERIOR. J. Minn. Acad. Sci. 43 (2): 7. 1977. SFA 23(1)
[Dep. Zool., Univ. Minn., Minneapolis] On August 18, 1975, a young-of-the-year white bass, /Morone chrysops/, was beachseined from Lake Superior at Marquette, Michigan. This is the first reported occurrence of the species in Lake Superior or its tributaries since an unverifiable sighting about 1830. Most likely the species has been recently introduced or has migrated through the St. Mary's River from Lake Huron or Lake Michigan.

78-000320 Kazancheyev, Ye. N. SPECIAL FEATURES OF THE SPRING DISTRIBUTION OF COMMERCIAL FISHES IN THE NORTHERN CASPIAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 574-582. 1976. SFA 23(1)
[KaspNIIRKh, Astrakhan', USSR] On the basis of data on the composition of spring catches, a description is given of the present distribution of commercial fish species in the Northern Caspian. Sturgeons predominated (by weight). The same zones are inhabited by sexually mature and immature species of sturgeon, vobla, bream and pike-perch. It is essential to devise new or to perfect the use of old fishing gear, enabling only the sexually mature fish to be caught, without an admixture of young.

78-000321 Kiss, R. LES POISSONS ET LA PECHE DANS LE LAC /IHEMA/ (/RWANDA/, BASSIN MOYEN DE L'AKAGERA). [FISHES AND FISHING IN THE IHEMA LAKE (RWANDA, MIDDLE BASIN OF AKAGERA).] Ann. Hydrobiol. 8 (2) : 263-318. 1977. In French with English summ. SFA 23(1)
[Inst. R. Sci. Nat. Belgrique, rue Vautier, 31, B 1040 Bruxelles, Belgium] The present work is a taxonomic and ecological study of the Ihema lake and describes the observations bearing on the usual fishing and the results of the experimental fishing which were effected from 1969 to 1973. An attempt was made to evaluate temporarily the possible fish production in this important water stretch.

78-000322 Mettee, M. F. A STUDY ON THE DISTRIBUTON OF /ETHEOSTOMA OKALOOSAE/, THE OKALOOSA DARTER, AND /ETHEOSTOMA EDWINI/, THE BROWN DARTER, IN NORTHWEST FLORIDA. J. Ala. Acad. Sci. 48 (3): 65. July 1977. SFA 23(1)
[Environ. Div., Geol. Serv. Ala., University] Abstract only.

78-000323 Mitchell, V. P., Jr.; Host, W. H., Jr.; Yokley, P., Jr. A RESURVEY OF THE ICHTHYOFAUNA OF CEDAR CREEK. J. Ala. Acad. Sci. 48 (3): 67. July 1977. SFA 23(1)
Abstract only. Cedar Creek drains an area of some 616 Km^2 in northwest Alabama. Four collections from nine stations revealed the presence of 40 species representing 11 families of fish. New records of /Moxostoma anisurum/, /Moxostoma duquesnii/, /Pimephales vigilax/, /Notorus miurus/, /Percina sciera/, /Percina evides/, /Percina shumardi/, /Etheostoma flabellare/, /Aplodinotus grunniens/, and /Angiulla rostrata/ were obtained for the Cedar Creek drainage.

78-000324 Peterman, L. G.; Haddix, M. H. PRELIMINARY FISHERY INVESTIGATIONS ON THE LOWER YELLOWSTONE RIVER. Proc. Fort Union Coal Field Symp. Vol. 2. 97-111. Apr. 1975. SFA 23(1)
[Mont. Dep. Fish Game, Box 430, Miles City 59301]

78-000325 Rayburn, K. J.; Freeze, T. M. THE AQUATIC FAUNA OF RUSSELLS CHAPEL SPRING, CALLOWAY COUNTY, KENTUCKY. Trans. Ky. Acad. Sci. 38 (3-4): 116-119. Sept. 1977. SFA 23(1)
[Dep. Biol. Sci., Murray State Univ., Murray, KY 42071] A survey of the aquatic fauna of Russells Chapel Spring in Calloway County, Kentucky, yielded the following kinds of organisms: 4 protozoans, 22 macroinvertebrates, 6 fishes, 2 amphibians, and 1 reptile. The collection includes a specimen of the rare aquatic earthworm /Haplotaxis gordioides/.

78-000326 Roberts, P. E.; Eggleston, D.; James, G. D. FRIGATE TUNA /AUXIS THAZARD/ IN NEW ZEALAND WATERS. N. Z. J. Mar. Freshwater Res. 11 (1): 163-167. Mar. 1977. SFA 23(1)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19-062, Wellington, New Zealand] Previous records of the frigate tuna /Auxis thazard/ (Lacepede, 1802) were probably misidentifications of the slender tuna /Allothunnus fallai/. Frigate tuna were caught on the north-east coast of New Zealand during 1975-76; the modal fork length of 176 specimens was 32-34 cm, and more detaled morphometry and counts from 4 specimens are presented.

78-000327 Robison, H. W. /FUNDULUS BLAIRAE/ WILEY AND HALL (CYPRINODONTIDAE) IN ARKANSAS. Southwest. Nat. 22 (4): 544. 15 Oct. 1977. SFA 23(1)
[Dep. Biol. Sci., South. Ark. Univ., Magnolia 71753]

78-000328 Robison, H. W. DISTRIBUTION, HABITAT, VARIATION, AND STATUS OF THE GOLDSTRIPE DARTER, /ETHEOSTOMA PARVIPINNE/ GILBERT AND SWAIN, IN ARKANSAS. Southwest. Nat. 22 (4): 435-442. 15 Oct. 1977. SFA 23(1)
[Dep. Biol. Sci., South. Ark. Univ., Magnolia 71753] The distribution of the goldstripe darter (/Etheostoma parvipinne/) in Arkansas is presented along with data on habitat, stream associates, and meristic variation of this species within the state. Also included is an analysis of the current status of /E. parvipinne/ in Arkansas.

78-000329 Rohde, F. C. FIRST RECORD OF THE LEAST BROOK LAMPREY, /OKKELBERGIA AEPYPTERA/, (PISCES: PETROMYZONIDAE) FROM ILLINOIS. Trans. Ill. State Acad. Sci. 69 (3): 313-314. Sept. 1976. SFA 23(1)
[Univ. N. Car., Inst. Mar. Sci., Morehead City 28557] The first record of the least brook lamprey, /Okkelbergia aepyptera/, from Illinois is presented. Meristic and morphometric characters are given. The least brook lamprey should be added to the State's rare and endangered species list.

78-000330 Starnes, W. C.; Itnier, D. A.; Starnes, L. B.; Douglas, N. H. ZOOGEOGRAPHIC IMPLICATIONS OF THE REDISCOVERY OF THE PERCID GENUS /AMMOCRYPTA/ IN THE TENNESSEE RIVER DRAINAGE. Copeia 1977 (4): 783-786. 25 Nov. 1977. SFA 23(1)
[Dep. Zool., Univ. Tenn., Knoxville 37916]

78-000331 Swift, C.; Yerger, R. W.; Parrish, P. R. DISTRIBUTION AND NATURAL HISTORY OF THE FRESH AND BRACKISH WATER FISHES OF THE OCHLOCKONEE RIVER, FLORIDA AND GEORGIA. Tall Timbers Res. Stn. Bull. No. 20. 111p. Oct. 1977. SFA 23(1)
[Nat. Hist. Mus. Los Angeles Cty., Sect. Fish., 900 Exposition Blvd., Los Angeles, CA 90007]

78-000332 Tong, L. J.; Saito, R. FURTHER POSTLARVAE OF TARAKIHI IN NEW ZEALAND WATERS. N. Z. J. Mar. Freshwater Res. 11 (1): 159-162. Mar. 1977. SFA 23(1)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19-062, Wellington, New Zealand] Thirteen cheilodactylid postlarvae, 14-68 mm standard length, indentified as tarakihi /Cheilodactylus macropterus/ (Bloch & Schneider), were collected in plankton samples from a number of locations around New Zealand. They provide further evidence of the pelagic nature of this phase of the life history of the tarakihi.

78-000333 Washington, P. M. FIRST SPECIMEN OF ROSETHORN ROCKFISH, /SEBASTES HELVOMACULATUS/ (AYRES 1859), RECORDED FROM PUGET SOUND, WASHINGTON. Northwest Sci. 51 (3): 216-218. Aug. 1977. SFA 23(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-000334 Weatherley, A. H. /PERCA FLUVIATILIS/ IN AUSTRALIA: ZOOGEOGRAPHIC EXPRESSION OF A LIFE CYCLE IN RELATION TO AN ENVIRONMENT. J. Fish. Res. Board Can. 34 (10): 1464-1466. Oct. 1977. In English with French summ. SFA 23(1)
[Life Sci., Scarborough Coll., Univ. Toronto, Toronto, ON, Canada]

78-000335 Wheeler, A. THE ORIGIN AND DISTRIBUTION OF THE FRESHWATER FISHES OF THE BRITISH ISLES. J. Biogeogr. 4 (1): 1-24. Mar. 1977. SFA 23(1)
[British Mus. (Nat. Hist.), London SW7 5BD, England] The origin and distribution of the freshwater fishes of the British Isles is discussed. With the exception of the secondary freshwater species which have gained entry to lakes and rivers by way of the sea and are correspondingly widely distributed, freshwater fishes are indigenous only to the river catchments bordering the eastern English Channel and the southern North Sea. All the indegenous primary freshwater fishes are believed to have entered England during the existence of a land bridge connected to continental Europe which was severed probably at the end of the Boreal period, at about 7500 years B.P. Their wide distribution outside these areas is due directly or indirectly to anthropogenic factors. The only indigenous freshwater fishes in Ireland are those which have entered from teh sea; all others have been introduced by man. Several relict populations of species, which entered lakes during the early post-glacial period and which were subsequently isolated by changes in land level relative to the sea, are also discussed.

78-000336 Wilk, S. J.; Morse, W. W.; Ralph, D. E.; Azarovitz, T. R. FISHES AND ASSOCIATED ENVIRONMENTAL DATA COLLECTED IN NEW YORK BIGHT, JUNE 1974-JUNE 1975. NOAA Tech. Rep. NMFS SSRF 716. iii + 53p. Sept. 1977. SFA 23(1)
[NMFS, Sandy Hook Lab., Highlands, NJ 07732] Tabulations of fishes and associated environmental observations are given for 700 trawl stations made during 30 collecting intervals in the New York Bight from June 1974 to June 1975. Summary tables included give the following information: collecting interval data (vessel, dates, stations sampled, gear, and area); station data (date, location, time of day, total catch, and environmental observation); and catch data for 127 species, representing 67 families (location, number, and weight). The 10 most frequently collected species were: /Merluccius bilinearis/ (456 stations), /Scophthalmus aquosus/ (419), /Raja erinacea/ (411), /Urophycis chuss/ (409), /Pseudopleuronectes americanus/ (363), /Hippoglossina oblonga (325), /Lophius americanus/ (305), /Peprilus triacanthus (284), /Paralichthys dentatus (272), and /Squalus acanthias/ (224).

78-000337 Yasui, M.; Inoue, M. OCEANOGRAPHIC FACTORS RELATED TO SKIPJACK FISHING CONDITIONS IN THE KINAN AND IZU REGIONS. Bull. Jpn. Soc. Sci. Fish. 43 (9): 1059-1067. Sept. 1977. SFA 23(1)
[Shizuoka Perfect. Fish. Exp. Stn., Yaizu, Shizuoka, Japan] An examination of the correlation between the availability of skipjack tuna in the Kinan and Izu regions and the oceanographic factors such as temperature (1955-1973) and salinity (1955-1972) revealed the following: (1) Oceanographic conditions in winter at the E-6 station in Satsunan region were examined statistically. The mean surface temperature of the excellent and good skipjack fishing years (1958, 1959, 1966, 1967, 1972) in the Kinan and Izu regions was 21.2°C, which is significantly higher than 19.8°C, the mean of the extremely poor and poor fishing years (1963, 1965, 1970, 1971). Similary, the mean surface salinity of the excellent and good years 1958, 1959, 1966,

78-000337 CONTINUED
1967, 1972) was 34.81°/oo, which was significantly lower than 34.87°/oo, the mean of the extremely poor and poor years (1960, 1963, 1965, 1969, 1970, 1971). (2) It is possible to forecast skipjack fishing conditon in the Kinan and Izu regions as well as in other regions through the examination of temperature and salinity distributions in the Satsunan region during the proceding winter unless (a) the year turns out to be a very productive year for albocore fishing, in which case the fishing effort will be diverted from skipjack fishing to albacore fishing, or (b) it happens to be a year in which the skipjack biting condition is very poor.

78-000338 Yerger, R. W. FISHES OF THE APALACHICOLA RIVER. Fla. Mar. Res. Publ. No. 26. p. 22-33. Apr. 1977. SFA 23(1)
[Fla. State Univ., Tallahassee 32306]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

78-000339 Anthony, D. D.; Jorgensen, C. R. FACTORS IN THE DECLINING CONTRIBUTIONS OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) TO THE FISHERY OF LAKE NIPISSING, ONTARIO, 1960-76. J. Fish. Res. Board Can. 34 (10): 1703-1709. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Biol. Sci., Nipissing Univ. Coll., North Bay, ON P1B 8L7, Canada]

78-000340 Arthur, D. K. DISTRUBITION, SIZE, AND ABUNDANCE OF MICROCOPEPODS IN THE CALIFORNIA CURRENT SYSTEM AND THEIR POSSIBLE INFLUENCE ON SURVIVAL OF MARINE TELEOST LARVAE. NOAA Fish. Bull. 75 (3): 601-611. July 1977. SFA 23(1)
[NMFS, P.O. Box 271, La Jolla, CA 92038] The California Current system can be divided into onshore and offshore faunal zones by a copepod indicator species, /Mecynocera causii/. Near the outer edge of the onshore zone copepod nauplii densities were higher than ususal. There were about 3 times as many microcopepodids and 12 times as many nauplii on the average throughout the onshore as in the offshore zone. Feeding habits of larvae of sardines, anchovies, and jack mackerel may be adapted to the usual naupliar and copepodid concentrations of the zone in which they were spawned. The usual concentration of 56-um and wider nauplii in the onshore zone was about 3/liter with 17/liter the highest observed which indicates that for nauplii of all sizes there were usually about 36/liter and with the highest density of 195/liter. These concentrations are lower than has usually been reported to be required for rearing larval fish in laboratories. Numbers of nauplii decreased exponentially with increasing size but a naupliar biomass maximum was found to occur at about the 70 um width. Nauplii of this size are ingested at first feeding by Pacific sardine, northern anchovy, and jack mackerel larvae. It is suggested that larval feeding habits of these fish have evolved to utilize this important food resource at their first feeding.

78-000341 Bagenal, T. B. EFFECTS OF FISHERIES ON EURASIAN PERCH (/PERCA FLUVIATILIS/) IN WINDERMERE. J. Fish. Res. Board Can. 34 (10): 1764-1768. Oct. 1977. In English with French summ. SFA 23(1)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria, England]

78-000342 Biro, P. EFFECTS OF EXPLOITATION, INTRODUCTIONS, AND EUTROPHICATION ON PERCIDS IN LAKE BALATON. J. Fish. Res. Board Can. 34 (10): 1678-1683. Oct. 1977. In English with French summ. SFA 23(1)
[Biol. Res. Inst. Hungarian Acad. Sci., 8237 Tahany, Hungary]

78-000343 Chevalier, J. R. CHANGES IN WALLEYE (/STIZOSTEDION VITREUM VITREUM/) POPULATION IN RAINY LAKE AND FACTORS IN ABUNDANCE, 1924-75. J. Fish. Res. Board Can. 34 (10): 1696-1702. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Northeast. Reg., Sault Ste. Marie, ON, Canada]

78-000344 Entz, B. ENVIRONMENTAL CONDITIONS OF PERCID WATERS IN CENTRAL EUROPE. J. Fish. Res. Board Can. 34 (10): 1586-1591. Oct. 1977. In English with French summ. SFA 23(1)
[Hungarian Acad. Sci., Biol. Res. Inst., Tihany, Hungary]

78-000345 Eshenroder, R. L. EFFECTS OF INTENSIFIED FISHING, SPECIES CHANGES, AND SPRING WATER TEMPERATURES ON YELLOW PERCH, /PERCA FLAVESCENS/, IN SAGINAW BAY. J. Fish. Res. Board Can. 34 (10): 1830-1838. Oct. 1977. In English with French summ. SFA 23(1)
[Mich. Dep. Nat. Resour., Alpena Great Lakes Fish. Stn., Alpena 49707]

78-000346 Forney, J. L. EVIDENCE OF INTER- AND INTRASPECIFIC COMPETITION AS FACTORS REGULATING WALLEYE (/STIZOSTEDION VITREUM VITREUM/) BIOMASS IN ONEIDA LAKE, NEW YORK. J. Fish. Res. Board Can. 34 (10): 1812-1820. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Nat. Resour., Cornell Univ., ithaca, NY 14853]

78-000347 Hartmann, J.; Numann, W. PERCIDS OF LAKE CONSTANCE, A LAKE UNDERGOING EUTROPHICATION. J. Fish. Res. Board Can. 34 (10): 1670-1677. Oct. 1977. In English with French summ. SFA 23(1)
[Inst. Seenforschung Fishchereiwesen, Langenargen, West Germany]

78-000348 Holcik, J. CHANGES IN FISH COMMUNITY OF KLICAVA RESERVOIR WITH PARTICULAR REFERENCE TO EURASIAN PERCH (/PERCA FLUVIATILIS/), 1957-72. J. Fish. Res. Board Can. 34 (10): 1734-1747. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Zool., Charles Univ., Prague, Czeckoslovakia]

78-000349 Hurley, D. A.; Christie, W. J. DEPRECIATION OF THE WARMWATER FISH COMMUNITY IN THE BAY OF QUINTE, LAKE ONTARIO. J. Fish. Res. Board Can. 34 (10): 1849-1860. Oct. 1977. In English with French summ. SFA 23(1)
[Glenora Fish. Stn., R.R. Picton, ON K0K 2T0, Canada]

78-000350 Johnson, F. H.; Hale, J. G. INTERRELATIONS BETWEEN WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND SMALLMOUTH BASS (/MICROPTERUS DOLOMIEUI/) IN FOUR NORTHEASTERN MINNESOTA LAKES, 1948-69. J. Fish. Res. Board Can. 34 (10): 1626-1632. Oct. 1977. In English with French summ. SFA 23(1)
[D. H. Schupp: Minn. Dep. Nat. Resour., Div. Fish Wildl., St. Paul 55155]

78-000351 Johnson, M. G.; Leach, J. H.; Minns, C. K.; Olver, C. H. LIMNOLOGICAL CHARACTERISTICS OF ONTARIO LAKES IN RELATION TO ASSOCIATIONS OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/), NORTHERN PIKE (/ESOX LUCIUS/), LAKE TROUT (/SALVELINUS NAMAYCUSH/), AND SMALLMOUTH BASS (/MICROPTERUS DOLOMIEUI/). J. Fish. Res. Board Can. 34 (10): 1592-1601. Oct. 1977. In English with French summ. SFA 23(1)
[Fish. Mar. Serv., Canada Cent. Inland Waters, Great Lakes Biolimnol. Lab., Burlington, ON L7R 4A6, Canada]

78-000352 Koonce, J. F.; Bagenal, T. B.; Carline, R. F.; Hokanson, K. E. F.; Nagiec, M. FACTORS INFLUENCING YEAR-CLASS STRENGTH OF PERCIDS: A SUMMARY AND A MODEL OF TEMPERATURE EFFECTS. J. Fish. Res. Board Can. 34 (10): 1900-1909. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Case Western Reserve Univ., Cleveland, OH 44106]

78-000353 Laurence, G. C. A BIOENERGETIC MODEL FOR THE ANALYSIS OF FEEDING AND SURVIVAL POTENTIAL OF WINTER FLOUNDER, /PSEUDOPLEURONECTES AMERICANUS/, LARVAE DURING THE PERIOD FROM HATCHING TO METAMORPHOSIS. NOAA Fish. Bull. 75 (3): 529-546. July 1977. SFA 23(1)
[NMFS, Narragansett Lab., Narragansett, RI 02882] A bioenergetic model was developed which simulated effects of temperature, prey density, and larval size on ability of winter flounder, /Pseudopleuronectes americanus/, larvae to obtain food energy to provide for experimentally determined growth and metabolism. Larval feeding at constant temperature and as a function of prey concentration was exponential and more sharply asymptotic in younger fish than in those near metamorphosis. Specific Growth rates were exponentially related to prey concentrations and ranged from 5.72 to 8.70 percent/day at survival prey concentrations of 3.7 to 21.7 cal/liter. Daily required feeding time was directly related to prey availability. critical plankton densities below which larvae did not have enough time during the day to obtain adequate food for growth and metabolism varied with age and ranged from 2.1 to 5.7 cal/liter. Simulated physiological energy utilization and required caloric food intake were inversely related to prey concentration and varied with larval stage of development. Food requirements expressed as number of copepod nauplii consumed per day ranged from 19 for first feeding larvae to 235 for metamorphosed juveniles. Predicted gross growth efficiencies were directly related to prey concentration and increased with age from 5 to 33 percent. All indications pointed to a "critical period" of larval survival during the period of exogenous feeding initiation and immediately after.

78-000354 Leach, J. H.; Johnson, M. G.; Kelso, J. R. M.; Hartmann, J.; Numann, W.; Entz, B. RESPONSES OF PERCID FISHES AND THEIR HABITATS TO EUTROPHICATION. J. Fish. Res. Board Can. 34 (10): 1964-1971. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Lake Erie Fish. Res. Stn., Wheatley, ON N0P 2P0, Canada]

78-000355 Lind, E. A. A REVIEW OF PIKEPERCH (/STIZOSTEDION LUCIOPERCA/), EURASIAN PERCH (/PERCA FLUVIATILIS/), AND RUFF (/GYMNOCEPHALUS CERNUA/) IN FINLAND. J. Fish. Res. Board Can. 34 (10): 1684-1695. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Zool., Univ. Oulu, Oulu, Finland]

78-000356 MacLean, J.; Magnuson, J. J. SPECIES INTERACTIONS IN PERCID COMMUNITIES. J. Fish. Res. Board Can. 34 (10): 1941-1951. Oct. 1977. In English with French summ. SFA 23(1)
[Minist. Nat. Resour., Maple, CN, Canada]

78-000357 Nagiec, M. PIKEPERCH (/STIZOSTEDION LUCIOPERCA/) IN ITS NATURAL HABITATS IN POLAND. J. Fish. Res. Board Can. 34 (10): 1581-1585. Oct. 1977. In English with French summ. SFA 23(1)
[Acad. Agric. Technol., Inst. Ichthyobiol. Fish., Olsztyn, Poland]

78-000358 Pivnicka, K.; Svatora, M. FACTORS AFFECTING THE SHIFT IN PREDOMINANCE FROM EURASIAN PERCH (/PERCA FLUVIATILIS/) TO ROACH (/RUTILUS RUTILUS/) IN THE KLICAVA RESERVOIR, CZECHOSLOVAKIA. J. Fish. Res. Board Can. 34 (10): 1571-1575. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Syst. Zool., Charles Univ., Prague, Czechoslovakia]

78-000359 Rundberg, H. TRENDS IN HARVESTS OF PIKEPERCH (/STIZOSTEDION LUCIOPERCA/), EURASIAN PERCH (/PERCA FLUVIATILIS/), AND NORTHERN PIKE (/ESOX LUCIUS/) AND ASSOCIATED ENVIRONMENTAL CHANGES IN LAKES MALAREN AND HJALMAREN, 1914-74. J. Fish. Res. Board Can. 34 (10): 1720-1724. Oct. 1977. In English with French summ. SFA 23(1)
[Lantbruksnamnden i Stockholms Lan, Solna, Sweden]

78-000360 Schneider, J. C.; Leach, J. H. WALLEYE (/STIZOSTEDION VITREUM VITREUM/) FLUCTUATIONS IN THE GREAT LAKES AND POSSIBLE CAUSES, 1800-1975. J. Fish. Res. Board Can. 34 (10): 1878-1889. Oct. 1977. In English with French summ. SFA 23(1)
[Mich. Dep. Nat. Resour., Fish. Div., Ann Arbor 48109]

78-000361 Spangler, G. R.; Payne, N. R.; Thorpe, J. E.; Byrne, J. M; Regier, H. A.; Christie, W. J. RESPONSES OF PERCIDS TO EXPLOITATION. J. Fish. Res. Board Can. 34 (10): 1983-1988. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Toronto, ON, Canada]

78-000362 Svardson, G. THE DECLINE OF THE BALTIC EEL POPULATION. Rep. Inst. Freshwater Res. Drottinghclm Nc. 55. p. 136-143. 1976. SFA 23(1)

[Inst. Freshwater Res., S-170 11 Drottingholm, Sweden] Catch records indicate a declining eel population along the Baltic coast of Sweden. The trend, which may have started around 1940, has in recent years accelerated at an alarming rate. Records from 19 stations along the Swedish west and east coasts, where elvers or climbing young eels are caught, show a decline in numbers over several decades. This proves that the eel larvae drifting into the Skagerrack from the North Sea must have become fewer. The sex ratio cf eels alcng the coast of Skane has changed during the period 1910-70. Females have become relatively more numerous, a development which is interpreted as further evidence of a decreasing eel populaticn pressure. The mortality of eel larvae within the North Sea has in all probability increased in recent years as a result of the trend towards a cooler climate and the consequences of overfishing various fish species. Large-scale introductions of elvers into the southern Baltic are suggested as experiments for future management of the eel stock.--Summ.

78-000363 Svardson, G. INTERSPECIFIC POPULATION DOMINANCE IN FISH COMMUNITIES OF SCANDINAVIAN LAKES. Rep. Inst. Freshwater Res. Drottingholm No. 55. p. 144-171. 1976. SFA 23(1)

[Inst. Freshwater Res., S-170 11 Drottingholm, Sweden] For centuries, the paucity of freshwater fish species in Scandinavian lakes and rivers and the zones of mcre or less elevated lakes to which natural postglacial spreading of fish was erratic, has stimulated landowners to "enrich" their lakes by introductions of fish from lower regions. These efforts have yielded a great body of experience, which is summarized in the paper. Regional comparisons has added some knowledge about the dominance of some fish species over others. The interactive relations of the best-known species is presented and some more general conclusions are discussed, regarding evolutionary trends and specific ecological niches, ecological subspeciation and non-genetic "interactive segregation". There is a trend that specialization on pelagic life contributes to dominance among lake-living fish. The dominance of some fish species seem correlated to their capacity to catch small-sized zooplankton, and this has far-reaching consequences for the plankton fauna and hence primary production. All kinds of stress on the freshwater fish community trigger off great shifts among species because of the dominance phenomena. The conversion of lakes into reservoirs, acidification and eutrophication are discussed and examples are given. The principle of "buffer species", smoothing the interactions between two antagonistic species, is presented. Some management suggestions are included.--Summ.

IDENTIFICATION, KEYS, CLASSIFICATION

78-000364 Berra, T. M.; Berra, R. M. A TEMPORAL AND GEOGRAPHICAL ANALYSIS OF NEW TELEOST NAMES PROPOSED AT 25 YEAR INTERVALS FROM 1869-1970. Copeia 1977 (4): 640-647. 25 Nov. 1977. SFA 23(1)

[Dep. Zool., Ohio State Univ., Mansfield 44906] A total of 1,537 new species names was reported for recent teleosts in the Pisces section of The Zoological Record for the years 1869, 1870, 1894, 1895, 1919, 1920, 1944, 1945, 1969, 1970. The 1,537 species represented 175 families, with cyprinids (11 percent), gobiids, (6 percent), characins (6 percent) and cichlids (5 percent) providing the most new names. The

78-000364 CONTINUED
year 1944 saw the publication of 262 new names while other years ranged from 109-190. The total number of names for living teleosts is estimated at about 24,000. The largest proportion of these new names (35 percent) was published in American journals. British publications were second with 14 percent. Of the newly proposed names of freshwater species, 35 percent were from South America, 30 percent from Africa and 23 percent from Asia. Of marine fishes, the tropical Pacific led with 31 percent of the new names, followed by the Indian Ocean (24 percent) and the tropical Atlantic (16 percent). The number of new freshwater and marine names was equally divided. American journals published many new names for fishes from the New World and Asia, but few names for African fishes, during the 10 sample years. Most African freshwater species names appeared in journals published in countries with former colonial interest, viz. Belgium, England and France. Similarly, many descriptions of Indian fishes appeared in British journals. American journals published names of fishes from all oceans, but most of them belonged to fishes from the Atlantic and Pacific.

78-000365 Bohlke, J. E.; Menezes, N. A. THE OPHICHTHID EEL /ANTOBRANTIA RIBEIROI/ PINTO 1970 A SYNONYM OF /OPHICHTHUS OPHIS/ (LINNAEUS 1758). Copeia 1977 (4): 786. 25 Nov. 1977. SFA 23(1)
[Acad. Nat. Sci. Phila., Philadelphia, PA 19103]

78-000366 Bortone, S. A. REVISION OF THE SEA BASSES OF THE GENUS /DIPLECTRUM/ (PISCES: SERRANIDAE). NOAA Tech. Rep. NMFS Circ. 404. v + 49p. Sept. 1977. SFA 23(1)
[Fac. Biol., Univ. West Fla., Pensacola 32504] Twelve species of /Diplectrum/ are recognized: three western Atlantic (/D. formosum/, /D. bivittatum/, and /D. radiale/) and nine eastern Pacific species (/D. pacificum/, /D. conceptione/, /D. maximum/, /D. rostrum/, /D. labarum/, /D. eumelum/, /D. sciurus/, /D. macropoma/, and /D. euryplectrum/). All species are hermaphroditic and possess an ovarian sinus in the posteriormost gonadal area. /Diplectrum/ osteological characters aid in defining the genus and in comparing its taxonomic status with /Serranus/. Definitions of the Serraninae and Serranidae are modified as a result of /Diplectrum/ osteological characters. The genus is basically restricted to the warm tropical-subtropical coastal areas of the new world. /Diplectrum bivittatum/, however, often occurs at insular localities, and /D. conceptione/ occurs in colder, temperate Peruvian waters. /Diplectrum formosum/ is considered to have a northern subspecies; /D. f. formosum/, and a western form, /D. f. radians/; /D. bivittatum/ is also composed of two subspecies: /D. b. bivittatum/ from South American and Caribbean areas and /D. b. arcuarium/ from the Gulf of Mexico. An intermediate population occurs in the vicinity of southern Florida. /Diplectrum radiale/ and /D. pacificum/ are "geminate species" and similar morphologically. /Diplectrum mexicanum/ is considered a junior synonym of /D. macropoma/.

78-000367 Collette, B. B.; Banarescu, P. SYSTEMATICS AND ZOOGEOGRAPHY OF THE FISHES OF THE FAMILY PERCIDAE. J. Fish. Res. Board Can. 34 (10): 1450-1463. Oct. 1977. In English with French summ. SFA 23(1)
[NMFS Syst. Lab., Natl. Mus. Nat. Hist., Washington, DC 20560]

78-000368 Contreras-Balderas, S.; Verduzco-Martinez, J. /DIONDA MANDIBULARIS/, A NEW CYPRINID FISH ENDEMIC TO THE UPPER RIO VERDE, SAN LUIS POTOSI, MEXICO, WITH COMMENTS ON RELATED SPECIES. Trans. San Diego Soc. Nat. Hist. 18 (16): 259-266. 27 July 1977. In English with Spanish summ. SFA 23(1)

[Fac. Cienc. Biol., Univ. Autonoma De Nuevo Leon, Ciudad Univ., Monterrey, N.L., Mexico] /Dionda mandibularis, n. sp., is described from localities in the Upper Rio Verde, State of San Luis Potosi, Mexico, on the basis of its double S-shaped intestine, longer than the standard length; pharyngeal teeth 4-4; 37-44 lateral-line scales, and 18-23 predorsal scales; 8 or 9 dorsal and usually 8 (7-10) anal rays. Particularly diagnostic is the shape of the mandible, with its lower surface flat and strongly angular in respect to its rami; the lower lip surpasses the upper by a distance nearly equal to its own thickness. This species adds a new element of Nearctic affinities to the interesting endemic fauna of the Rio Verde, and to the Panuco-Tamesi system.

78-000369 Dawson, C. E. THE PIPEFISH NAME /SYNGNATHUS CORRUGATUS/ WEBER, A JUNIOR SYNONYM OF /BHANOTIA FASCICLATA/ (DUMERIL). Copeia 1977 (4): 786-788. 25 Nov. 1977. SFA 23(1)

[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

78-000370 Gery, J.; Mahnert, V. DESCRIPTION D'UNE ESPECE ET D'UNE SOUS-ESPECE NOUVELLES D'AFRIQUE OCCIDENTALE DU GENRE /BRYCINUS/ (PISCES, CYPRINIFORMES, CHARACOIDEI), AVEC UNE REVUE DE LA SUPER-ESPECE /BRYCINUS LONGIPINNIS/ (GUNTHER, 1864). [DESCRIPTION OF A NEW SPECIES AND SUBSPECIES OF THE GENUS /BRYCINUS/ FROM WEST AFRICA (PISCES, CYPRINIFORMES, CHARACOIDEI), WITH A REVIEW OF THE SUPERSPECIES /BRYCINUS LONGIPINNIS/ (GUNTHER, 1864).] Rev. Suisse Zool. 84 (3): 617-643. Sept. 1977. In French with English summ. SFA 23(1)

[Argentonesse, Castels, F-24220 Saint-Cyprien, France] The African superspecies /Brycinus longipinnis/ (family Alestidae) is reviewed. A new species, /B. derhami/, and a new subspecies, /B. longipinnis bagbeensis/, are described. The types of /B. longipinnis/, /B. chaperi/ and /intermedius/ are redescribed, and several geographical forms of the two former species are studied. An identification key to the members of the superspecies is provided.

78-000371 Gold, J. R. SYSTEMATICS OF WESTERN NORTH AMERICAN TROUT (/SALMO), WITH NOTES ON THE REDBAND TROUT OF SHEEPHEAVEN CREEK, CALIFORNIA. Can. J. Zool. 55 (11): 1858-1873. Nov. 1977. In English with French summ. SFA 23(1)

[Genet. Sect., Texas A&M Univ., College Station 77843] Phyletic relationships among the six nominal species of western North American trout (genus /Salmo/), and a yet unnamed form, the redband trout, are discussed in light of present knowledge of zoogeography, morphology, karyology, and genetic similarity. Also included is a description of redband trout from Sheepheaven Creek, California. Redband trout and Kern River golden trout, /Salmo aguabonita/, are closely related phyletically. They both possess the same chromosome and chromosome arm number, resemble each other in several meristic characters and in external coloration and spotting, and share the same fixed or most common allele at several biochemical-genetic loci. Zoogeographic considerations are not inconsistent with the hypothesis that a redband-/S. aguabonita/ line evolved from an ancestral trout radiating from the North Pacific. It is suggested that the closest living relative to the redband-/S. aguabonita/ line is the rainbow trout, /Salmo gairdneri/. The cutthroat trouts, /Salmo clarki/, may be an

78-000371 CONTINUED
earlier divergence from this same phyletic line. The Apache trout, /Salmo apache/, is considered more distantly related to /S. clarki/ than has been previously suggested.

78-000372 Heemstra, P. C.; Randall, J. E. A REVISION OF THE EMMELICHTHYIDAE (PISCES: PERCIFORMES). Aust. J. Mar. Freshwater Res. 28 (3): 361-396. June 1977. SFA 23(1)
[Div. Fish. Oceanogr., CSIRO, P.O. Box 21, Cronulla, N.S.W. 2230, Australia] The marine fish family Emmelichthyidae is redefined to include only the genera /Emmelichthys/ (four species), /Erythrocles/ (four species) and /Plagiogeneion/ (two species). Two new species of /Emmelichthys/ from the Pacific Ocean are described. /Emmelichthys nitidus/ Richardson is divided into two subspecies: /E. nitidus nitidus/ occurring from South Africa to New Zealand and /E. nitidus cyanescens/ (Guichenot) from the Juan Fernandez Islands and coast of Chile. Descriptions and keys to the genera and species are provided.

78-000373 Hubbs, C. L.; Miller, R. R. SIX DISTINCTIVE CYPRINID FISH SPECIES REFERRED TO /DIONDA/ INHABITING SEGMENTS OF THE TAMPICO EMBAYMENT DRAINAGE OF MEXICO. Trans. San Diego Soc. Nat. Hist. 18 (17): 267-335. 2 Sept. 1977. In English with Spanish summ. SFA 23(1)
[Scripps Inst. Oceanogr., La Jolla, CA 92093] Six sharply differentiated species of Cyprinidae that seem to be referable to the genus /Dionda/ inhabit the drainage basin of the Rio Panuco of eastern Mexico. One also occupies five minor stream systems intervening between Rio Panuco and the abrupt physiographic and faunal break north of Veracruz. These species contribute to the diverse and highly endemic character of the moderately rich fish fauna of the Rio Panuco stream complex. Three of the six species have been named recently, and two, /D. catostomops/ and /D. dichroma/, are described as new. The six species constitute three allopatric, physiographically separated pairs.

78-000374 Kok, H. M.; Blaber, S. J. M. A NEW FRESHWATER GOBY (TELEOSTEI: GOBIIDAE) FROM THE PONGOLO FLOODPLAIN, ZULULAND, SOUTH AFRICA. Zool. Afr. 12 (1): 163-168. 1977. SFA 23(1)
[Zool. Dep., Univ. Natal, Pietermaritzburg, South Africa]

78-000375 Laroche, W. A. DESCRIPTION OF LARVAL AND EARLY JUVENILE VERMILION SNAPPER, /RHOMBOPLITES AURORUBENS/. NOAA Fish. Bull. 75 (3): 547-559. July 1977. SFA 23(1)
[Sch. Oceanogr., Oreg. State Univ., Corvallis 97331] Larval and early juvenile development of vermilion snapper, /Rhomboplites aurorubens/, family Lutjanidae, is described and illustrated. Identification and description are based upon morphology, pigmentation, and meristics of 27 larval and 11 early juvenile specimens ranging from 4.0 to 14.2 mm standard length. All specimens were collected 65 km east of Sapelo Island, Ga., lat. 31°30'N, long. 80°30'W on 10 August 1972.

78-000376 Page, L. M.; Braasch, M. E. SYSTEMATIC STUDIES OF DARTERS OF THE SUBGENUS /CATONOTUS/ (PERCIDAE), WITH THE DESCRIPTION OF A NEW SPECIES FROM THE LOWER CUMBERLAND AND TENNESSEE RIVER SYSTEMS. Univ. Kans. Mus. Nat. Hist. Occas. Pap. 60. 18p. 20 Oct. 1976. SFA 23(1)
[Ill. Nat. Hist. Surv., Urbana 61801]

78-000377 Page, L. M.; Braasch, M. E. SYSTEMATIC STUDIES OF DARTERS OF THE SUBGENUS /CATONOTUS/ (PERCIDAE), WITH THE DESCRIPTION OF A NEW SPECIES FROM THE DUCK RIVER SYSTEM. Univ. Kans. Mus. Nat. Hist. Occas. Pap. 63. 18p. 1 Apr. 1977. SFA 23(1)
[Ill. Nat. Hist. Surv., Urbana 61801]

78-000378 Pinchuk, V. I. SYSTEMATICS OF THE GOBY, GENERA /GOBIUS/ LINNE (NATIVE SPEICES), /NEOGOBIUS/ ILJINU AND /MESOGOBIUS/ BLEEKER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 543-552. 1976. SFA 23(1)
/Gobius albosignatus/ Kessler, 1874, and /Gobius capitonellus/ Kessler, 1874 are not synonyms of /Gobius cobitis/ Pallas, 1814, but of /Gobius paganellus/ Linne, 1758. Recognition of the Caspian populations of /Neogobius syrman/ (Nordmann, 1840) as a separate subspecies (/Eurystomus/ Kessler, 1877) was caused by confusing the Caspian /N. syrman/ with another species, /Neogobius bathybius/ (Kessler, 1877). "Freed" from the addition of /N. bathybius/ the series of Caspian /N. syrman/ differs less from the series of /N. syrman/ from the Black Sea basin than the series from the different Black Sea coastal regions differ from each other. The differences discovered through biometric analysis are not sufficient for subspecific recognition. A description is given of a new species from the Black Sea, from /Neogobius cephalargoides/ sp. n. (previously called by the author "broad-lipped form of /Gobius ratan/"), and the history of the usage of the species designation /cephalarges/ Pallas, 1814, used in the previous works of the author in the sense in which it was used by Nordmann (1840) and Il'in (1927, 1949), which must be rejected in the light of new data.

78-000379 Seigel, J. A.; Pietsch, T. W.; Robison, B. H.; Abe, T. /SQUALIOLUS SARMENTI/ AND /S. ALII/, SYNONYMS OF THE DWARF DEEPSEA SHARK, /SQUALIOLUS LATICAUDUS/. Copeia 1977 (4): 788-791. 25 Nov. 1977. SFA 23(1)
[Dep. Biol., Calif. State Univ., Long Beach 90840]

78-000380 Talwar, P. K. ON SOME FISH TYPES DESCRIBED FROM THE R. I. M. S. "INVESTIGATOR" COLLECTIONS (1884-1926). Copeia 1977 (4): 635-640. 25 Nov. 1977. SFA 23(1)
[Fish Div., Zool. Surv. India, Indian Mus. New Bldg., Calcutta 16, India]

78-000381 Taubert, B. D. EARLY MORPHOLOGICAL DEVELOPMENT OF THE GREEN SUNFISH, /LEPOMIS CYANELLUS/, AND ITS SEPARATION FROM OTHER LARVAL /LEPOMIS/ SPECIES. Trans. Am. Fish. Soc. 106 (5): 445-448. Sept. 1977. SFA 23(1)
[Mass. Coop. Fish. Res. Unit, Univ. Mass., Amherst 01003]

78-000382 Trewavas, E. THE SCIAENID FISHES (CROAKERS OR DRUMS) OF THE INDO-WEST-PACIFIC. Trans. Zool. Soc. Lond. 33 (4): 253-541. July 1977. SFA 23(1)
[Dep. Zool., British Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

78-000383 Wiley, E. O.; Stewart, J. D. A GAR (/LEPISOSTEUS/ SP.) FROM THE MARINE CRETACECUS NIOBRARA FORMATION OF WESTERN KANSAS. Copeia 1977 (4): 761-762. 25 Nov. 1977. SFA 23(1)
[Mus. Nat. Hist., Univ. Kansas, Lawrence 66045]

78-000384 Woodland, D. J.; Allen, G. R. /SIGANUS TRISPILOS/, A NEW SPECIES OF SIGANIDAE FROM THE EASTERN INDIAN OCEAN. Copeia 1977 (4): 617-620. 25 Nov. 1977. SFA 23(1)
[Dep. Zool., Univ. New England, Armidale, N.S.W., 2351, Australia]

78-000385 Yevseyenko, S. A. LARVAE OF /BOTHUS OCELLATUS/ FROM THE NORTH-WESTERN ATLANTIC. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 598-605. 1976. SFA 23(1)
[VNIRO, Moscow, USSR] A description of the larvae of /B. ocellatus/ from 3.2 to 16.2 mm is given and their distribution is examined. A comparison is made between the larvae of /B. ocellatus/ and /B. podas/.

PARASITES AND DISEASES-GENERAL

78-000386 Bell, G. R. ASPECTS OF DEFENSE MECHANISMS IN SALMONIDS. Proc. Int. Symp. Diseases Cultured Salmonids 56-73. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Pac. Biol. Stn., Fish. Mar. Serv., Nanaimo, BC, Canada]

78-000387 Cone, D. K.; Anderson, R. C. PARASITES OF PUMPKINSEED (/LEPOMIS GIBBOSUS/ L.) FROM RYAN LAKE, ALGONQUIN PARK, ONTARIO. Can. J. Zool. 55 (9): 1410-1423. Sept. 1977. SFA 23(1)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] /Lepomis gibbosus/, in Ryan Lake for 7 years, harboured 21 species of parasites. Myxosporidea were the most prevalent parasites of young-of-the-year fish. At age group I, pumpkinseed had acquired most parasites found. /Urocleidus dispar/ and /U. similis/ infected age groups I and older; intensity increased with host age. Prevalences of /Tetracotyle/ sp., /Uvulifer ambloplitis/, /Posthodeplostomum minmum/, /Clinostomum marginatum/, /Diplostomulum scheuringi/, and /D. huronense/ increased with host age. Prevalences of /Apophallus brevis/ were similar in age groups I and older. Intensities of /U. amblophlitis/ and /P. minimum/ increased with host age. Intensity of /Tetracotyle/ sp. increased with host age up to fish of age group II; metacercariae were acquired during summer. Larval Dilepididae were in age group I and older and intensity decreased from age group I to II. Larval /Spiroxys/ sp. and /Eustrongylides/ sp. were most prevalent in age groups II and older and infections were acquired in summer. Glochidia were found only on fish collected in spring. Prevalences of /M. csburni/ and /M. uvuliferis/ increased and /M. magnaspherus/ and /M. dechtiari/ decreased with host age. Prevalence of /M. ohioensis/ was similar in all age groups. /Trichodina/ sp. was rare.

78-000388 Dorson, M. UTILISATION DE LA VACCINATION POUR LA PREVENTION DES MALADIES EN SALMONICULTURE. [USE OF VACCINES FOR THE PREVENTION OF DISEASES IN SALMON CULTURE.] Riv. It. Piscic. Ittiop. 12 (2): 43-53. Apr.-Mar.-June 1977. In Italian and French. SFA 23(1)
[Lab. Ichtyopathol., Route de Thiverval 78850-Thiverval-Grignon, France]

78-000389 Edwards, R. W.; Harley, J. P.; Williams, J. C. PARASITES OF CHANNEL CATFISH FROM THE KENTUCKY RIVER, WITH A COMPARATIVE NOTE ON THE OHIO RIVER. Trans. Ky. Acad. Sci. 38 (3-4): 132-135. Sept. 1977. SFA 23(1)
[Dep. Zool., Univ. Ark., Fayetteville 72701] One hundred sixty-one channel catfish were collected from the Kentucky River drainage from April 1975 through June 1976 and examined for parasites. The parasites recovered were: Trematoda: /Acetodextra amiuri/; Cestoda: /Corallobothrium/ sp., /C. fimbriatum/, /C. giganteum/; Nematoda: /Contracaecum/ sp.; and Crustacea: /Ergasilus arthrosis/. Seasonal variation was observed in /A. amiuri/, /C. fimbratum/, /C. giganteum/, and /E. arthrosis/. /Acetodextra amiuri/, /Contracaecum/ sp., /C. giganteum/, and /E. arthrosis/ are new state records.

78-000390 Evelyn, T. P. T. IMMUNIZATION OF SALMONIDS. Proc. Int. Symp. Diseases Cultured Salmonids 161-176. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC, Canada]

78-000391 Ghittino, P. INSPECTION AND CERTIFICATION OF FISH FOR THE INTERNATIONAL CONTROL OF INFECTIOUS DISEASES OF SALMONIDS. Proc. Int. Symp. Diseases Cultured Salmonids 74-86. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[OEI, Exp. Inst. Anim. Prophylaxis, Torino, Italy]

78-000392 Gruninger, T. L.; Murphy, C. E.; Britton, J. C. MACROPARASITES OF FISH FROM EAGLE MOUNTAIN LAKE, TEXAS. Southwest. Nat. 22 (4): 525-535. 15 Oct. 1977. SFA 23(1)
[Dep. Biol., Texas Christian Univ., Fort Worth 76129] From September, 1973, through October, 1974, 397 fish representing 9 species and 3 families were collected from Eagle Mountain Lake, Tarrant-Wise Counties, Texas. The following fish species were examined: /Aplodinotus grunniens/, /Ictalurus punctatus/, /Micropterus salmoides/, /M. punctulatus/, /Pomoxis annularis/, /Lepomis gulosus/, /L. macrochirus/, /L. megalotis/, and /L. macrolophus/. Thirty-two species of parasites representing 22 families and 26 genera were recovered. Seventy-three percent of the fish examined harbored at least one species of helminth, annelid, mollusk, or crustacean parasite. Parasite loads were light and do not appear to pose a serious threat to the species of fish studied. A comparison of fish collected from heated waters with those taken outside the influence of thermal loading suggests little effect of thermal loading upon incidence of parasitism when fish are permitted free access to both areas.

78-000393 Harley, J. P. PARASITES OF THE WHITE CRAPPIE FROM LAKE WILGREEN, KENTUCKY. Trans. Ky. Acad. Sci. 38 (3-4): 136-138. Sept. 1977. SFA 23(1)
[Dep. Biol. Sci., East. Ky. Univ., Richmond 40475] A survey of 150 white crappies from Lake Wilgreen, Kentucky, yielded 8 species of parasites. New host records are reported for /Contracaecum brachyurum/ and /Ergasilus arthrosis/. New State records in the white crappie are reported for /Crepidostomum cornutum/, /Postodiplostomum minimum/, /Proteocephalus ambloplitis/, /Camallanus oxycephalus/, /Contracaecum brachyurum/, /C. spiculigerum/, /Pomphorhynchus bulbocolli/, and /Ergasilus caeruleus/.

78-000394 Kilambi, R. V.; Becker, D. A. POPULATION DYNAMICS AND SPECIES DIVERSITY OF ICHTHYO-PARASITOFAUNA OF THE BUFFALO NATIONAL RIVER. Univ. Ark. Water Resour. Res. Cent. No. 48, v + 73p. 1977. SFA 23(1)
[Dep. Zool., Univ. Ark., Fayetteville]

78-000395 Kimura, T.; Awakura, T. CURRENT STATUS OF DISEASE OF CULTURED SALMONIDS IN HOKKAIDO, JAPAN. Proc. Int. Symp. Diseases Cultured Salmonids 124-160. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Lab. Microbiol., Fac. Fish., Hokkaido Univ., Hakodate, Hokkaido, Japan]

78-000396 McIntyre, J. D. HERITABLE TOLERANCE OF DISEASE IN SALMONIDS. Proc. Int. Symp. Diseases Cultured Salmonids 87-90. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[U.S. FWS, West. Fish Dis. Lab., Seattle, WA]

78-000397 Needham, E. A. THE SALMONID PATHOLOGIST IN 1977. Proc. Int. Symp. Diseases Cultured Salmonids 8-15. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Unilever, Ltd., Aberdeen, Scotland]

78-000398 Vestergard-Jorgensen, P. E. SURVEILLANCE AND ERRADICATION OF DISEASES FROM HATCHERIES. Proc. Int. Symp. Diseases Cultured Salmonids 72-73. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Vet. Serum Lab., Arhus, Denmark]

BACTERIAL DISEASES

78-000399 Bullock, G. L. DETECTION AND CONTROL OF BACTERIAL INFECTIONS IN FISHES. Proc. Int. Symp. Diseases Cultured Salmonids 179-181. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[U.S. FWS, East. Fish Dis. Lab., Kearneysville, WV]

78-000400 De Figueiredo, J.; Plumb, J. A. VIRULENCE OF DIFFERENT ISOLATES OF /AEROMONAS HYDROPHILA/ IN CHANNEL CATFISH. Aquaculture 11 (4): 349-354. Aug. 1977. SFA 23(1)
[Cent. Pesq. Ictiol./DNOCS, Av Bezerra de Meneses 2045, Fortaleza, Ceara, Brazil] The virulence of nine /Aeromonas hydrophila/ isolates from diseased fish, diseased /Macrobrachium/ (freshwater shrimp) and from pond water was determined in channel catfish (/Ictalurus punctatus/) fingerlings. According to the lethal dose--50 percent end point (LD(50)) of each isolate, the water organisms were significatnly (/P/ less than 0.05) less virulent than the isolates from diseased fish. All isolates were biochemically similar.

78-000401 Hastein, T.; Smith, J. E. A STUDY OF /VIBRIO ANGUILLARUM/ FROM FARMED AND WILD FISH USING PRINCIPAL COMPONENTS ANALYSIS. J. Fish Biol. 11 (2): 69-75. Aug. 1977. SFA 23(1)
[Natl. Vet. Inst, Oslo, Norway] Principal components analysis revelaed two main groups among 163 /Vibrio anguillarum/ cultures from diseased fish from Norwegian waters. Nearly all isolates from farmed salmonids fell in group I (arabinose positive) but those from wild fish, particularly saithe /Gadus virens/, more commonly appeared in group II (arabinose negative).

78-000402 Horne, M. T.; Richards, R. H.; Roberts, R. J.; Smith, P. C. PERACUTE VIBRIOSIS IN JUVENILE TURBOT /SCOPHTHALMUS MAXIMUS/. J. Fish Biol. 11 (4): 355-361. Oct. 1977. SFA 23(1)
[Dep. Biol., Univ. Stirling, Scotland] An outbreak of an acute oedematous disease characterised by orbital and abdominal swelling, and high mortality, in young turbot, was studied. The clinical and pathological picture was consistent with a circulating toxaemia principally affecting the heart, orbit and kidney. /Vibrio anguillarum/, virtually identical with type strain NCMB6, was isolated in pure culture from all organs of all fish. Therapy was only marginally successful using antibiotics but in a small group subjected to temperature reduction below 10° C, losses were reduced from 20 percent to 5 percent compared with the controls.

78-000403 McCarthy, D. H. PRESENT STATUS OF AEROMONAS INFECTIONS. Proc. Int. Symp. Diseases Cultured Salmonids 182-189. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Minist. Agric. Fish. Food, Fish Dis. Lab., Weymouth, Dorset, England]

78-000404 Muroga, K.; Sugiyama, T.; Ueki, N. PASTEURELLOSIS IN CULTURED BLACK SEABREAM (/MYLIO MACROCEPHALUS/). J. Fac. Fish. Anim. Husb. Hiroshima Univ. 16 (1): 17-21. Aug. 1977. In English with Japanese summ. SFA 23(1)
[Dep. Fish., Hiroshima Univ., Japan]

78-000405 Reynolds, W. W. FEVER AND ANTIPYRESIS IN THE BLUEGILL SUNFISH, /LEPOMIS MACROCHIRUS/. Comp. Biochem. Physiol. C Comp. Pharmacol. 57 (2): 165-167. 1977. SFA 23(1)
[Pa. State Univ., Wilkes-Barre 18708]

78-000406 Sebastian, C. A.; Fairgrieve, W. T. THE USE OF CHLORAMPHENICOL AS AN ANTIBACTERIAL AGENT FOR PREVENTING POST-SPAWNING MORTALITY OF SILVER CARP (/HYPOPHTHALMICHTHYS MOLITRIX/). Philipp. Bur. Fish. Aquatic Resour. Tech. Pap. Ser. 1 (2): 1-2. May 1977. SFA 23(1)

FUNGAL DISEASES

78-000407 Ghittino, P.; Cortellezzi, G. C. CASO DI MICOSI RENALE NELLA TROTA IRIDEA. [A CASE REPORT OF KIDNEY MYCOTIC INFECTION IN RAINBOW TROUT.] Riv. It. Piscic. Ittiop. 12 (2): 55-58. Apr.-Mar.-June 1977. In Italian with English summ. SFA 23(1)
[Inst. Zooprof. Sper. Piemonte, Liguria e Valle d'Aosta, Via Bologna, 148, 10154 Torino, Italy] The authors described a kidney mycotic infection found by chance in a hatchery rainbow trout. The posterior kidney is hypertrophic and, histologically, an accumulation of hyphae is evident in the hemopoietic portion. This is embedded in a granulomatous tissue. This fungus has not been isolated by the authors, since the trout has been randomized by chance and fixed in formalin. Basing on its morfology in the section, they suppose to be in presence of /Phoma herbarum/, a Deuteromycete already reported by the literature in salmonids. The authors described this case with the aim of contributing to the knowledge on the pathology of trout kidney, a chapter which warrants fundamental research.

78-000408 Pickering, A. D.; Willoughby, L. G. EPIDERMAL LESIONS AND FUNGAL INFECTION ON THE PERCH, /PERCA FLUVIATILIS/ L., IN WINDERMERE. J. Fish Biol. 11 (4): 349-354. Oct. 1977. SFA 23(1)
[Freshwater Biol. Assoc., Ambleside, Cumbria, England] An account is given of the Histological changes associated with epidermal lesions on the Windermere perch, /Perca fluviatilis/ L., between the months of January and March, 1976. During the latter stages of the development of the lesions an apparent succession of fungal colonization was observed. A total of five genera of fungi were identified with /Leptomitus lacteus/ appearing early in the infection and /Achlya/ tending to dominate the more advanced lesions. The initial cause of the lesions has not been identified but the possibility of /Argulus/ damage is discussed.

78-000409 Shah, K. L.; Jha, B. C.; Jhingran, A. G. OBSERVATIONS ON SOME AQUATIC PHYCOMYCETES PATHOGENIC TO EGGS AND FRY OF FRESHWATER FISH AND PRAWN. Aquaculture 12 (2): 141-147. Oct. 1977. SFA 23(1)
[Cent. Inland Fish. Res. Unit, Khanjarpur, Bhagalpur 812001, India] The present paper deals with isolates belonging to five genera of phycomycetes, viz., /Saprolegnia/, /Achlya/, /Aphanomyces/, /Pythium/ and /Leptomitus/, which were found on eggs and fry of freshwater fish and prawn. Of these, three, /Aphanomyces stellata/ de Bary, /Pythium/ sp. and /Leptomitus libertae/ (Gruith), are reported here for the first time as parasites of Indian fish and prawn.

PROTOZOAN DISEASES

78-000410 George, E.; Harrison, E. J.; Hadley, W. F. THE INCIDENCE OF /MYXOBOLUS DENTIUM/ (PROTOZOA: MYXOSPORIDA) IN /ESOX MASQUINONGY/ OF THE UPPER NIAGARA RIVER. Trans. Am. Fish. Soc. 106 (5): 476-480. Sept. 1977. SFA 23(1)
[Dep. Biol., State Univ. N.Y. Buffalo, Buffalo 14214]

78-000411 Khan, R. A. BLOOD CHANGES IN ATLANTIC COD (/GADUS MORHUA/) INFECTED WITH /TRYPANOSOMA MURMANENSIS/. J. Fish. Res. Board Can. 34 (11): 2193-2196. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

78-000412 Knight, S. A.; Janovy, J., Jr.; Current, W. I. /MYXOSOMA FUNDULI/ KUDO 1918 (PROTOZOA: MYXOSPORIDA) IN /FUNDULUS KANSAE/: SUMMER EPIZOOTIOLOGY. J. Parasitol. 63 (5): 897-902. Oct. 1977. SFA 23(1)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588] The occurrence and distribution of the myxosporidan /Myxosoma funduli/ on the gills of the plains killifish (/Fundulus kansae/) were investigated; /Fundulus kansae/ is reported as a new host. Host samples from various sites on the South Platte River, Nebraska, were collected during the summer months of 1975 and 1976. The protozoan parasite population was shown to be overdispersed within the host population, and this distribution was similar to that described by the negative binomial equation. Demographic characteristics of the infected fish subpopulation were virtually identical to those of the whole fish population. Infection intensity was independent of gill bar number or side. The frequency of bilateral infections was 0.54, of left only infections was 0.23, and of right only infections was 0.22. Distribution of immature and mature plasmodia indicated that a pre-existing infection did not preclude a new infection, and suggested a prepatent period of less than two months.

78-000413 Meyers, T. R.; Sawyer, T. K.; MacLean, S. A. /HENNEGUYA/ SP. (CNIDOSPORA: MYXOSPORIDA) PARASITIC IN THE HEART OF THE BLUEFISH, /POMATOMUS SALTATRIX/. J. Parasitol. 63 (5): 890-896. Oct. 1977. SFA 23(1)
[Dep. Avian Aquatic Anim. Med., N.Y. State Vet. Coll., Cornell Univ., Ithaca 14853] A myxosporidan parasite, /Henneguya/ sp., was discovered in the bulbus and truncus arteriosus of bluefish, /Pomatomus saltatrix/. Infected fish were captured from the Atlantic Ocean near Montauk Point, Long Island, New York, Raritan Bay, New Jersey, and Chesapeake Bay, Maryland. Comparative features of mature spores showed that they were similar to those of /Henneguya sebasta/ Moser and Love 1975, from the bulbus arteriosus of seven species of California rockfish, /Sebastes/. Studies on growth stages of the parasite from both host species are necessary before a definite identification of the bluefish parasite can be made.

78-000414 Moser, M.; Noble, E. R. THE GENUS /MYXOPROTEUS/ (PROTOZOA: MYXOSPORIDA) IN MACROURID FISHES. Int. J. Parasitol. 7 (4): 253-255. Aug. 1977. SFA 23(1)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106] Five species, two new, of myxosporida in the Genus /Myxoproteus/ were found in geographically widespread deepsea macrourid fishes. Some myxosporida showed little tissue specificity. The spore size remained constant among hosts and over long distances.

78-000415 Tandon, R. S.; Chandra, S. PHYSIOLOGY OF HOST PARASITE RELATIONSHIP: EFFECTS ON SERUM ALKALINE PHOSPHATASE LEVELS OF FISH HOSTS PARASITIZED BY TRYPANOSOMES. Z. Parasitenkd. 52 (3): 195-198. 1977. SFA 23(1)
[Dep. Zool., Lucknow Univ., Lucknow, India] Serum alkaline phosphatase levels of five species of fresh water fish hosts were altered by trypanosome parasites. The loss in enzymatic activity ranged from 3.91 percent to 69.91 percent in the five species of infected fishes as compared to normal level in the healthy hosts. The maximal reduction in the enzymatic activity caused by trypanosomes was observed in the herbivore carp fish /Cirrhina mrigala/ and the minimal loss in the fresh water shark /Wallago attu/.

78-000416 Tandon, R. S.; Chandra, S. STUDIES ON ECOPHYSICLOGY OF FISH PARASITES: EFFECT OF TRYPANOSOME INFECTION ON THE SERUM CHOLESTEROL LEVELS OF FISHES. Z. Parasitenkd. 52 (3): 199-202. 1977. SFA 23(1)
[Dep. Zool., Lucknow Univ., Lucknow, India] Serum cholesterol levels of six species of fresh water fishes were lowered due to trypanosome infection. The percentage of infection in the different species of hosts ranged from 3.27 percent in /Clarias batrachus/ to 16.66 percent in /Wallago attu/. Loss in serum cholesterol level was highest (42.39 percent) in the spiny eel /Mastocembelus armatus/ and lowest in the carp /Cirrhina mrigala/ (4.56 percent). Thus hypocholesterolemia was evidently caused in the fishes by trypanosomes.

78-000417 Wolf, K. /MYXOSOMA CEREBRALIS/: DETECTION AND CONTROL. Proc. Int. Symp. Diseases Cultured Salmonids 177-181. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[U.S. FWS, East. Fish Dis. Lab., Kearneysville, WV]

VIRAL DISEASES

78-000418 Ahne, W.; Wolf, K. SPRING VIREMIA OF CARP. U.S. Fish Wildl. Serv. Fish Dis. Leafl. 51. 11p. 1977. SFA 23(1)
[Inst. Zool. Hydrobiol., 8 Muchen 22, Kaulbachstrasse 37, West Germany]

78-000419 Dorson, M.; de Kinkelin, P. OVERVIEW OF VIRAL DISEASES OF SALMONID. Proc. Int. Symp. Diseases Cultured Salmonids 91-115. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Inst. Natl. Rech. Agron., Lab. Ichtyopathol., Thiverval-Grignon, France]

78-000420 Hill, B. J. PRESENT STATUS OF IPN VIRUS. Proc. Int. Symp. Diseases Cultured Salmonids 116-119. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Minist. Agric. Fish. Food, Fish Dis. Lab., Weymouth, Dorset, England]

78-000421 Sano, T. VIRAL DISEASES OF CULTURED SALMONIDS IN JAPAN. Proc. Int. Symp. Diseases Cultured Salmonids 120-123. Apr. 1977. Limited number of Proceedings available from D. F. Amend, Tavolek, Inc., 2779 152nd Ave. NE, Redmond, WA 98052. SFA 23(1)
[Tokyo Univ. Fish., 4-5-7 Konan, Minato-ku, Tokyo, Japan]

78-000422 Seeley, R. J.; Perlmutter, A.; Seeley, V. A. INHERITANCE AND LONGEVITY OF INFECTIOUS PANCREATIC NECROSIS VIRUS IN THE ZEBRA FISH, /BRACHYDANIO RERIO/ (HAMILTON-BUCHANAN). Appl. Environ. Microbiol. 34 (1): 50-55. July 1977. SFA 23(1)
[Lab. Aquatic Biol., N.Y. Univ., New York 10003] Zebra fish (/Brachydanio rerio/) were injected with infectious pancreatic necrosis virus (IPNV) and then spawned to determine whether the virus was passed on to the eggs, and if it was, how long it remained in the free-swimming F(1). The mating variations included parents receiving one or two injections of virus, and within these categories, matings in which both parents were treated or only one parent was treated. The results showed that transmission of IPNV to the egg did occur, and that this transmission was via the female alone. However, if the female was allowed to produce antibodies to the virus, as when she received two injections of IPNV, she transmitted the virus to the eggs for only a short period of time. In addition, when the virus was transmitted to the egg, it remained in the free-swimming F(1) for a period of at least 5 months.

OTHER DISEASES AND PARASITES

78-000423 Anderson, R. M.; Whitfield, P. J.; Mills, C. A. AN EXPERIMENTAL STUDY OF THE POPULATION DYNAMICS OF AN ECTOPARASITIC DIGENEAN, /TRANSVERSOTREMA PATIALENSE/: THE CERCARIAL AND ADULT STAGES. J. Anim. Ecol. 46 (2): 555-580. June 1977. SFA 23(1)
[Dep. Zool., Univ. London King's Coll., London WC2R 2LS, England]

78-000424 Combs, D. L.; Harley, J. P.; Williams, J. C. HELMINTH PARASITES OF THE SPOTTED SUCKER AND GOLDEN REDHORSE FROM THE KENTUCKY RIVER. Trans. Ky. Acad. Sci. 38 (3-4): 128-131. Sept. 1977. SFA 23(1)
[Northeast Reg. Res. Stn., 4101 Boston Ave., Muskogee, OK 74401] The following helminths were recovered from 56 spotted suckers: Acanthocephala, /Acanthocephalus/ sp.; Cestoidea, /Biacetabulum banghami/, /Biacetabulum/ sp., /Isoglaridacris folius/, /Monobothrium ulmeri/, and /Promonobothrium minytremi/; and 62 golden redhorse:

78-000424 CONTINUED
Acanthocephala, /Acanthocephalus/ sp. and /Neoechinorhynchus prolixoides/; Cestoidea, /Biacetabulum/ sp., /Isoglaridacris folius/, /Monobothrium ulmeri/, and /Promonobothrium minytremi/; and Nematoda, /Camallanus oxycephalus/ and /Rhabdochona/ sp. from the main channel of the Kentucky River. Four of 6 species of helminths recovered from spotted suckers and 4 of 8 species recovered from golden redhorse are new host records, and 8 of 9 species recovered are new state records.

78-000425 Fischthal, J. H. SOME DIGENETIC TREMATODES OF MARINE FISHES FROM THE BARRIER REEF AND REEF LAGOON OF BELIZE. Zool. Scr. 6 (2): 81-88. 1977. SFA 23(1)
[Dep. Biol. Sci., State Univ. N.Y., Binghamton] A total of 200 marine fishes (36 species) from the Caribbean Sea off Belize were examined for digenetic trematodes and 163 (81.5 percent) harbored at least one species. Five species are described as new: /Lasiotocus asymmetricus/ (Monorchiidae) from /Haemulon flavolineatum/; /Stephanostomum belizense/ (Acanthocolpidae) from /Caranx bartholomaei/; /Neolepidapedon belizense/ (Lepocreadiidae) from /Sphyraena barracuda/; /Opecoeloides belizensis/ (Opecoelidae) from /Priacanthus arenatus/; /Saturnius belizensis/ (Hemiuridae) from /Mugil curema/. 72 previously known species were identified, and all represent new geographical distribution records while many are recorded from new hosts. Their zoogeographical affinites are very strongly with the tropical western Atlantic, although some also occur in the eastern Atlantic, Mediterranean, and Indo-Pacific regions.

78-000426 Ghittino, P.; Andruetto, S.; Vigliani, E. L'AMEBIASI DELLA TROTA IRIDEA D'ALLEVAMENTO. [THE AMEBIASIS OF HATCHERY RAINBOW TROUT.] Riv. It. Piscic. Ittiop. 12 (3): 74-89. July-Aug.-Sept. 1977. In Italian with English summ. SFA 23(1)
[Ist. Zooprof. Spec., Via Bologna 148, 10100 Torino, Italy]

78-000427 Hendrix, S. S.; Overstreet, R. M. MARINE ASPIDOGASTRIDS (TREMATODA) FROM FISHES IN THE NORTHERN GULF OF MEXICO. J. Parasitol. 63 (5): 810-817. Oct. 1977. SFA 23(1)
[Dep. Biol., Gettysburg Coll., Gettysburg, PA 17325] Of the aspidogastrids /Multicalyx cristata/, /Lobatostoma ringens/, /Cotylogaster basiri/, and /C. dinosoides/ sp. n., the last two had not been previously known from the gulf of Mexico. The latter differs from other members of its genus by having relatively large equatorial marginal alveoli in comparison to those at the anterior and posterior ends of the holdfast. It also possesses extensive transverse musculature connecting opposed lateral alveoli. New host records are included for all four species, and we report preadults of what appear to be the first two species.

78-000428 Henricson, J. THE ABUNDANCE AND DISTRIBUTION OF /DIPHYLLOBOTHRIUM DENDRITICUM/ (NITZSCH) AND /D. DITREMUM/ (CREPLIN) IN THE CHAR /SALVELINUS ALPINUS/ (L.) IN SWEDEN. J. Fish Biol. 11 (3): 231-248. Sept. 1977. SFA 23(1)
[Fish. Board Sweden, St. Torget 3, S-87100 Harnosand, Sweden] A total of 654 char, /Salvelinus alpinus/ (L.) and 33 brown trout, /Salmo trutta/ L., were examined for the plerocercoids of /Diphyllobothrium dendriticum/ (Nitzsch, 1824) and /D. ditremum/ (Creplin, 1825). Only char were found to be infected. Both parasitic species were abundant. The incidence and mean intensity of infection for /D. dendriticum/ were 83.2 percent and 8.8, respectively; for /D. ditremum/ 93.7 percent and 45.0. There was no variation in the intensity of infection between different parts of the lake. The

78-000428 CONTINUED
incidence and intensity of infection increased with the age of the fish to 8+ for both species. From this age the intensity of infection leveled off or decreased. No differences in intensity of infection between the sexes were found. The frequency distribution of parasite counts were overdispersed and fitted the negative binomial distribution even within single age-groups. The two parasite species showed a high positive correlation in intensity of infection, /D. ditremum/ was concentrated in the stomach and pyloric caeca. /D. dendriticum/ was more widely distributed within the host and was supposed to kill heavily infected fish.

78-000429 Ho, J.-S.; Bashirullah, A. K. M. TWO SPECIES OF CALIGID COPEPODS (CRUSTACEA) PARASITIC ON MARINE FISHES OF VENEZUELA, WITH DISCUSSION OF /METACALIGUS/ THOMSEN, 1949. J. Nat. Hist. 11 (6): 703-714. Nov.-Dec. 1977. SFA 23(1)
[Dep. Biol., Calif. State Univ., Long Beach 90840]

78-000430 Johnson, E. C. A COMPARISON OF HELMINTH PARASITES OF THE SUNFISH FAMILY (CENTRARCHIDAE) IN THREE MICHIGAN LAKES. J. Ala. Acad. Sci. 48 (3): 64. July 1977. SFA 23(1)
[Jacksonville State Univ., Jacksonville, AL] Abstract only.

78-000431 Kelle, W. UNTERSCHIEDLICH STARKER PARASITENBEFALL DER WITTLINGE /MERLANGIUS MERLANGUS/ DES NEUWERKER FAHRWASSERS IM SOMMER 1974. [THE DIFFERENT INFESTATION BY PARASITES TO /MERLANGIUS MERLANGUS/ OF THE NEUWERKER FAHRAWASSER (ELBE, ESTUARY) IN SUMMER 1974.] Arch. Fischereiwiss. 28 (1): 65-68. July 1977. In German with English summ. SFA 23(1)
[Inst. Hydrobiol. Fischereiwiss., Univ. Hamburg, West Germany] 89 whitings of catches from June, July and August 1974 were observed for parasites. They were specially infested by the parasitic copepod /Lernaeocera branchialis/ in maximum by five. The main infestation was in June. A prejudice of the fish by /L. branchialis/ could be shown.

78-000432 Lambert, A. DEVELOPPEMENT LARVAIRE ET POST-LARVAIRE D'/ERGENSTREMA MUGILIS/ PAPERNA, 1964 (MONOGENE, ANCYROCEPHALIDAE) PARASITE DE /LIZA RAMADA/ (RISSO, 1826) (TELECSTEEN, MUGILIDAE). [LARVAL AND POST-LARVAL DEVELOPMENT OF /ERGENSTREMA MUGILIS/ PAPERNA, 1964 (MONOGENEA, ANCYROCEPHALIDAE) PARASITE OF /LIZA RAMADA/ (RISSO, 1826) (TELEOSTEI, MUGILIDAE).] Z. Parasitenkd. 52 (3): 229-240. 1977. In French with English summ. SFA 23(1)
[Lab. Parasitol. Comp., Univ. Sci. Tech. Languedoc, F-34060 Montpellier Cedex, France] The ciliated cells, chaetotaxy and excretory system of the oncomiracidium are fully described in /Ergenstrema mugilis/ Paperna, 1964. The study of the post-larval development shows a phase of cutaneous infestation in the fish host and the mode of transmission is discussed among Dactylogyroidea. The morphogenesis of the parasite haptor is described. The origin and migration of the hamuli in Dactylogyroidea are discussed.

78-000433 Love, P. O.; Ffolliott, P.; Goodwin, J. G. NEMATODE PARASITES IN LARGEMOUTH BASS, PRESA DE NOVILLO RESERVOIR, SONORA, MEXICO. Southwest. Nat. 22 (4): 537-538. 15 Oct. 1977. SFA 23(1)
[Sch. Renewable Nat. Resour., Univ. Ariz., Tucson]

78-000434 Mayes, M. A. NEW SPECIES OF /GYRODACTYLUS/ AND /DACTYLOGYRUS/ (TREMATODA: MONOGENEA) FROM FISHES OF NEBRASKA. J. Parasitol. 63 (5): 805-809. Oct. 1977. SFA 23(1)
[Lab. Parasitol., Sch. Vet. Med., Univ. Pa., Philadelphia 19104] Six new monogenetic trematodes are described from Nebraska fishes: /Gyrodactylus bulbacanthus/ sp. n. from /Fundulus kansae/ (Garman); /G. callawayensis/ sp. n. from /Notropis lutrensis/ (Baird and Garard); /G. eos/ sp. n. from /Phoxinus eos/ (Cope); /G. nebraskensis/ from /Phoxinus neogaeus/ (Cope); /G. planensis/ from /Notropis dorsalis/ (Agassiz); and /Dactylogyrus pectenatus/ from /Pimephales promelas/ (Rafinesque/). This is the second report of monogeneans from Nebraska fishes.

78-000435 Moccia, R. D.; Leatherland, J. F.; Sonstegard, R. A. INCREASING FREQUENCY OF THYROID GOITERS IN COHO SALMON (/ONCORHYNCHUS KISUTCH/) IN THE GREAT LAKES. Science 198 (4315): 425-426. 28 Oct. 1977. SFA 23(1)
[R. A. Sonstegard: Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Coho salmon collected during the 1976 spawning runs from Lakes Michigan, Ontario, and Erie had overt goiter frequencies of 6.3, 47.6, and 79.5 percent, respectively. These represent significant increases over the frequencies observed in previous years. Epizootiological data suggest that environmental goitrogens (possibly pollutants) may be involved in the etiology of the thyroid disorder.

78-000436 Ogawa, K.; Egusa, S. THE FIRST RECORD OF /DACTYLOGYRUS MINUTUS/ KULWIEC, 1927 (MONOGENEA: DACTYLOGYRIDAE) FROM THE REARED CARP (/CYPRINUS CARPIO/) IN JAPAN. Bull. Jpn. Soc. Sci. Fish. 43 (9): 1029-1034. Sept. 1977. SFA 23(1)
[Fac. Agric., Univ. Tokyo, Tokyo, Japan] A dactylogyrid was found parasitizing the gills of the 0 year carp (/Cyprinus carpio/) reared at farms in Nagano Prefecture. The dactylogyrid was identified as /Dactylogyrus minutus/ (Monogenea: Dactylogyridae). The discovery of this species is the first recorded case in Japan. The chitinous parts and the other structures of the species are also redescribed in this paper. The shape and the size of the chitinous parts almost agree with those reported by foreign authors, except the lack of a chitinous ring at the distal end of the uterus. No such structure was found in the present specimens. Kulwiec did not mention a chitincus ring at the site in his original description of the species. Morphologically this species is characterized by the structure of the ovary and the vagina. The former originates behind the testis and is curved or folded in shape. The latter has a chitinous ring at its opening. The vaginal duct is dilated to form the receptaculum seminis.

78-000437 Oliver, G. EFFET PATHOGENE DE LA FIXATION DE /DIPLECTANUM AEQUANS/ (WAGENER, 1857) DIESING, 1858 (MONOGENEA, MONOPISTHOCOTYLEA, DIPLECTANIDAE) SUR LES BRANCHIES DE /DICENTRARCHUS LABRIX/ (LINNAEUS, 1758), (PISCES, SERRANIDAE). [PATHOGENIC EFFECT OF FIXATION OF /DIPLECTANUM AEQUANS/ (WAGENER, 1857) DIESING, 1858 (MONOGENEA, MONOPISTHOCOTYLEA, DIPLECTANIDAE) ON THE GILLS OF /DICENTRARCHUS LABRAX/ (LINNAEUS, 1758) (PISCES, SERRANIDAE).] Z. Parasitenkd. 53 (1): 7-11. 1977. In French with English summ. SFA 23(1)
[Cent. Univ. Perpignan, ave de Villeneuve, F-66025 Perpignen Cedex,

78-000437 CONTINUED
France] The fixation study of /Diplectanum aequans/ (Wagener, 1857) Diesing, 1858, shows a pathogenic effect on the host gills, /Dicentrarchus labrax/ (Linnaeus, 1758). This effect is revealed by an hyperplasia of the gills tissue around the haptor fixation and haemorrhages on the hooks insertion points.

78-000438 Overstreet, R. M.; Pritchard, M. H. TWO NEW ZOOGONID DIGENEA FROM DEEP-SEA FISHES IN THE GULF OF PANAMA. J. Parasitol. 63 (5): 840-844. Oct. 1977. SFA 23(1)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564] /Panopula cavernossa/ gen. et sp. n. from the intestine of the brotulid /Enchelybrotula (?) paucidens/ differs from other members of the Steganodermatinae by having testes near the anterior of the acetabulum, a posttesticular ovary, and a postequatorial acetabulum. Two related species are transferred to the genus /Brachyenteron/ as /B. pycnorganum/ comb. n. and /B. spinosum/ comb. n. /Neosteganoderma gillissi/ sp. n. from the synaphobranchid eel /Synaphobranchus bathybius/ differs from /N. glandulosum/ and /N. polymixiae/, the most similar species, because conspicuous glandular cells envelope the esophagus and pharynx, others about the genital atrium occur in elongated sacs, epithelium is lacking at the cecal bifurcation, and the cirrus sac is straight. We establish /N. infundibulum/ comb. n. and expand Steganodermatinae to include /Brevicreadium congeri/ and /Hudsonia agassizi/.

78-000439 Prudhoe, S.; Hussey, C. G. SOME PARASITIC WORMS IN FRESHWATER FISHES AND FISH-PREDATORS FROM THE TRANSVAAL, SOUTH AFRICA. Zool. Afr. 12 (1): 113-147. 1977. SFA 23(1)
[British Mus. (Nat. Hist.), London, England]

78-000440 Sood, M. L. A REFERENCE LIST OF NEMATODE PARASITES FROM INDIAN FRESHWATER FISHES. Res. Bull. Panjab Univ. Sci. 24 (I-II): 33-41. June 1973. SFA 23(1)
[Dep. Zool., Panjab Agric. Univ., Ludhiana, India] A list of Indian freshwater fishes with nematode parasites reported from them has been given. In addition, record, author, habitat and locality are also given.

78-000441 Sylvester, J. R.; Dammann, A. E.; Dewey, R. A. CIGUATERA IN THE U.S. VIRGIN ISLANDS. Mar. Fish. Rev. 39 (8): 14-16. Aug. 1977. SFA 23(1)
[Bur. Fish Wildl., Dep. Conserv. Cult. Aff., St. Thomas, VI] Ciguatera has a long and continuing history in the U.S. Virgin Islands. Throughout the years, much folklore has accumulated about its origins, mode of transmission in the environment, and treatment of its symptoms. Little reliable evidence is available on the biological and ecological nature of ciguatera in the islands. Quantitative data is sparce on species, location, and areal and seasonal distributions. Probability statements with adequate confidence limits cannot be made for individual fish caught from any location. A simple, effective, reliable test for individual fish which does not involve human or animal consumption is not available. In conclusion, ciguatera is a serious hindrance to full commercial exploitation of the limited Virgin Islands fisheries resources, and much work needs to be done here in the islands and throughout the Caribbean.--Summ.

78-000442 Uhazy, L. S. BIOLOGY OF /PHILCMETROIDES HURONENSIS/ (NEMATODA: DRACUNCULOIDEA) IN THE WHITE SUCKER (/CATCSTCMUS COMMERSONI/). Can. J. Zool. 55 (9): 1430-1441. Sept. 1977. SFA 23(1)

[Dep. Biol., Univ. Calif., Los Angeles 90024] White suckers (/Catostomus comersoni/ (Lacepede)) collected from various locations in southern Ontario were examined for /Philcmetroides huronensis/ Uhazy, 1976. Stages of the parasite were recovered from the peritoneum around the swim bladder, bases of the fins, and the fins. Prevalence of infections was high and intensities relatively low. The parasite was less prevalent in longnose (/Catcstomus catostomus/ (Forster)) and redhorse (/Moxostoma macrolepidotum/ (LeSueur)) suckers collected from the same area. Males, female fourth-stage larvae, uniseminated, inseminated, subgravid, and gravid females were recovered from fish collected from soutern Lake Huron. Prevalence was 83 to 100 percent throughout the year and showed no significant seasonal trend. Numbers of worms recovered ranged from 1 to 32 per fish; 77 percent were infected with from 1 to 7 worms. Intensities of infections varied significantly with season, being highest during fall, winter, and early spring. All age groups of white suckers were infected; however, intensity did not vary significantly with host age. Although /P. huronensis/ was highly prevalent throughout the year and from one year to the next, the life cycle was completed in a single year. The evolution of three valid species in the Philometrinae from the white sucker in North America is proposed, based on the evidence that before Pleistocene glaciation there were three separate forms of white sucker.

78-000443 Williams, A. D.; Campbell, R. A. A NEW TETRAPHYLLIDEAN CESTODE, /GLYPHOBOTHRIUM ZWERNERI/ GEN. ET SP. N., FROM THE COWNOSE RAY, /RHINOPTERA BONASUS/ (MITCHILL 1815). J. Parasitol. 63 (5): 775-779. Oct. 1977. SFA 23(1)

[Dep. Biol., Southeast. Mass. Univ., North Dartmouth 02747] A new cestode, /Glyphobothrium zwerneri/ gen. et sp. n., is described from the spiral valve of /Rhinoptera bonasus/ (Mitchell 1815) taken from Chesapeake Bay, Virginia. Distinguishing characteristics include: 1) globular scolex with superficial multiloculated bothridea; and 2) testes and circummedullary vitellaria extending the full length of the segment. The locular pattern resembles that of /Dioecotaenia/ Schmidt 1969, but the species appears most closely related to phyllobothriids having multi-oculated bothridea. /Glyphobothrium/ is tentatively placed in the family Phyllobothriidae Braun 1900 despite unusual features such as superficial bothridia, presence of postovarian testes, and circum-medullary vitellaria.

POLLUTION

78-000444 Abbott, O. J.; Perkins, P. J. FURTHER STUDIES UPON A STEEL WORKS EFFLUENT. Mar. Pollut. Bull. 8 (9): 210-213. Sept. 1977. SFA 23(1)

[Mar. Lab., Univ. Strathclyde, The Fort, Kilcreggan, Helensburgh, Dunbartonshire, Scotland] Despite its visual impact and the substantial release of effluent from a steel works on the Cumbrian coast, an earlier study suggested that it was likely to have little environmental effect. A further examination of this plant has been made and the original conclusion confirmed.

78-000445 Armstrong, F. A. J.; Lutz, A. LAKE HURON, 1974: PCB, CHLORINATED INSECTICIDES, HEAVY METALS AND RADIOACTIVITY IN OFFSHORE FISH. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 692. v + 15p. 1977. In English with French summ. SFA 23(1)

[Fish. Mar. Serv., Freshwater Inst., Winnipeg, MB, Canada] Thirteen samples of burbot (/Lota lota/), bloater chub (/Coregonus hoyi/), and slimy sculpin (/Cottus cognatus/), comprising 569 fish from 6 locations in Lake Huron in 1974 were analysed for contaminants. Most samples were of about 50 whole fish; these were grouped in fives to make 10 subsamples which were homogenised for analysis. PCB, dieldrin, DDT fractions and mercury were determined on all 13 samples, and BHC, methoxychlor, chlordane, As, Cd, Cr, Cu, Pb, Se and Zn on 5. Some Samples were also tested for other organics, for other metals and for radioactivity. The methods used are given in outline, with their reproducibility. Mean length, weight, and fat content are listed. PCB was above the present Canadian limit of 2 ug/g in one sample of bloater chub and in one of burbot. All samples comply with Canadian and U.S. regulations for DDT and mercury. There were few consistent species differences in levels of chlorinated insecticides. Two samples of bloater chub contained arsenic at 1.72 and 2.26 ug/g. Radioactivity was low.

78-000446 Armstrong, F. A. J.; Lutz, A. LAKE SUPERIOR, 1974: PCB, CHLORINATED INSECTICIDES, HEAVY METALS AND RADIOACTIVITY IN OFFSHORE FISH. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 693. vi + 17p. 1977. In English with French summ. SFA 23(1)

[Fish. Mar. Serv., Freshwater Inst., Winnipeg, MB, Canada] twenty-five samples of lake trout (/Salvelinus namaycush/), siscowet (/Salvelinus namaycush siscowet), burbot (/Lota lota/), bloater, (/Coregonus hoyi/), lake herring, (/Coregonus artedii/), and slimy sculpin, (/Cottus cognatus/), comprising 1176 fish from 9 locations in Lake Superior in 1974 have been analyzed for contaminants. Except for one sample of filet, most were of about 50 whole fish; these were grouped in fives to make 10 subsamples which were homogenized for analysis. PCB, dieldrin, DDT fractions and mercury were determined on all 25 samples, and BHC, methoxychlor, chlordane, As, Cd, Cr, Cu, Pb, Se and Zn on 8. Some samples were also tested for other organics, for other metals and for radioactivity. The methods used are given in outline, with their reproducibility. Mean length, weight and fat content are listed. PCB was above the present Canadian limit of 2 ug/g in lake trout from 3 locations, DDT is above Canadian and United States limits of 5 ug/g in lake trout from 3 locations, and mercury is at or above the Canadian and United States limits of 0.5 ug/g in lake trout from 6 locations and in burbot from one. Lake trout and siscowet were markedly higher in PCB, DDT and mercury than the other fishes. Slimy sculpin and lake herring were lowest. There were some small but consistent differences in contamination between locations. Radioactivity was low in the samples analyzed.

78-000447 Bebbington, G. N.; Mackay, N. J.; Chvojka, R.; Williams, R. J.; Dunn, A.; Auty, E. H. HEAVY METALS, SELENIUM AND ARSENIC IN NINE SPECIES OF AUSTRALIAN COMMERCIAL FISH. Aust. J. Mar. Freshwater Res. 28 (3): 277-286. June 1977. SFA 23(1)

[M. J. Mackay: North. Rivers Coll. Advanced Educ., P.O. Box 157, Lismore, N.S.W., 2480 Australia] Results of a survey of metal levels in nine species of important commercial fish from New South Wales waters are reported. Muscle samples from 20-30 individuals of each species were analysed for mercury, cadmium, lead, copper and zinc. Eight to 12 individuals of each species were analysed for selenium and arsenic. Of the 232 fish analysed, 231 had concentrations of cadmium, lead, copper and zinc below the National Health and Medical Research

78-000447 CONTINUED
Council (NHMRC) standards for these elements in foodstuffs. Several specimens of bream, snapper, mulloway, kingfish, Australian salmon and yellowfin tuna had total mercury concentrations in excess of the NHMRC standard of 0.5 ppm. These fish accounted for approximately 7 percent of the total number sampled. None of the sea mullet, flathead and tailor sampled exceeded the standard for mercury. The mercury in all species sampled occurred almost entirely as methyl mercury. Of the 95 fish analysed for arsenic and selenium, 20 fish (21 percent) had arsenic concentrations equal to or greater than the NHMRC standard for selenium. The health risks associated with the presence of mercury and arsenic in these species are discussed.

78-000448 FAO of the UN REPORT OF THE SECOND SESSION OF THE ACMRR WORKING PARTY ON BIOLOGICAL ACCUMULATORS. FAO Fish. Rep. No. 165. v + 9p. 1975. SFA 23(1)
[FAO of the UN, Rome, Italy]

78-000449 Greig, R. A.; Wenzloff, D. R. TRACE METALS IN FINFISH FROM THE NEW YORK BIGHT AND LONG ISLAND SOUND. Mar. Pollut. Bull. 8 (9): 198-200. Sept. 1977. SFA 23(1)
[NMFS, Middle Atl. Coastal Fish. Cent., Milford Lab., Milford, CT 06460] Concentrations of silver, cadmium, chromium, copper, mercury, manganese, nickel, lead and zinc were measured in five species of finfish collected from the New York Bight and two from Long Island Sound. With few exceptions the trace metal contents were similar for the various species examined and also for a single species when comparing catch locations. Metal levels also were similar to concentrations reported by two other invesitgators who studied fish from the North Atlantic.

78-000450 Hall, A. S.; Teeny, F. M.; Gauglitz,, E. J., Jr. MERCURY IN FISH AND SHELLFISH OF THE NORTHEAST PACIFIC. III. SPINY DOGFISH, /SQUALUS ACANTHIAS/. NOAA Fish. Bull. 75 (3): 642-645. July 1977. SFA 23(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-000451 Hilsenhoff, W. L. USE OF ARTHROPODS TO EVALUATE WATER QUALITY OF STREAMS. Wis. Dep. Nat. Resour. Tech. Bull. No. 100. 15p. 1977. SFA 23(1)
[Wis. Dep. Nat. Resour., Box 7921, Madison 53707] Arthropods were used to evaluate the water quality of Wisconsin streams. The biotic index based upon arthropod samples is a sensitive and effective method, for it yields information on present quality and past perturbations. Every species was assigned an index value on the basis of collections made previously and in this study, for the purpose of calculating the biotic index. Water quality determinations were then made for 53 Wisconsin streams based on these values. A sampling procedure for evaluating all streams in an area is given.

78-000452 Howells, G. IN AND OUT OF HOT WATER. Mar. Pollut. Bull. 8 (11): 245-248. Nov. 1977. SFA 23(1)

78-000453 Kempf, C.; Sittler, B. IA POLLUTION DE IA ZOOCENOSE RHENANE PAR LE MERCURE ET LES PRODUITS ORGANOCHLORES. [MERCURY AND ORGANOCHLORINE POLLUTION IN THE RHINE RIVER BASIN; ITS EFFECTS UPON BIRD AND FISH POPULATIONS.] Terre Vie 31 (4): 661-668. 1977. In French with English summ. SFA 23(1)
[Inst. Bot., 28 rue Goethe, 67083 Strasbourg Cedex, France] After a mass mortality of fish in river Rhine, determinations of various toxichemicals (Mercury and organochlorine compounds) were made in five species of fish and in the eggs of six species of birds. The high concentrations of these pollutants found both in fish and birds quite probably explain their increased mortality rate during the period 1973-1975; it might also be responsible for some abnormal behavior patterns recently noticed among gulls.--Summ.

78-000454 Leslie, J. K.; Kelso, J. R. M. INFLUENCE OF A PULP AND PAPER MILL EFFLUENT ON ASPECTS OF DISTRUBITION, SURVIVAL AND FEEDING OF NIPIGON BAY, LAKE SUPERIOR, LARVAL FISH. Bull. Environ. Contam. Toxicol. 18 (5): 602-610. Nov. 1977. SFA 23(1)
[Fish. Mar. Serv., P.O. Box 5050, Burlington, ON L7R 4A6, Canada] Surface distribution of Nipigon Bay larval fish was characterized by high abundance, between 500 and 2100 larval fish/10,000 m^3 near shore, particularly in proximity to the pulp and paper mill effluent discharge, and low abundance, less than 100/10,000 m^3 away from shore. Static bioassay indicated that approximately 60 percent effluent concentration was intolerable to the natural mixed larval fish community. No wood fibre was found amoung stomach contents and no difference was apparent in stomach contents of fish caught in influenced and uninfluenced areas. Data therefore suggest that larval fish either were not greatly influenced by plume conditions or were transients.

78-000455 Lopez, J. M.; Lee, G. F. ENVIRONMENTAL CHEMISTRY OF COPPER IN TORCH LAKE, MICHIGAN. Water Air Soil Pollut. 8 (4): 373-385. Oct. 1977. SFA 23(1)
[Cent. Environ. Stud., Univ. Texas, Richardson 75080]

78-000456 McDermott-Ehrlich, D. J.; Sherwood, M. J.; Heesen, T. C.; Young, D. R.; Mearns, A. J. CHLORINATED HYDROCARBONS IN DOVER SOLE, /MICROSTOMUS PACIFICUS/: LOCAL MIGRATIONS AND FIN EROSION. NOAA Fish. Bull. 75 (3): 513-517. July 1977. SFA 23(1)
[Lockheed Cent. Mar. Res., P.O. Box 398, Avila, CA 93424] Dover sole, /Microstomus pacificus/, with and without fin erosion were collected from the municipal wastewater discharge sites of Los Angeles and Orange counties. While there was a significant difference between the total DDT levels in muscle tissue of the unaffected fish from the two regions, there was no significant regional difference between the muscle DDT levels in the diseased fish. This is consistent with the proposed hypothesis that the Orange County diseased fish had originated at the Los Angeles County discharge site. Comparisons of chlorinated hydrocarbon levels in diseased and unaffected Dover sole from the Palos Verdes discharge site of Los Angeles County indicate: 1) DDT levels were significantly higher (/P/ less than 0.05) in Dover sole with fin erosion, and 2) polychlorinated biphenyl levels were higher at the 90 percent confidence level (/P/ less than 0.10) in diseased sole.

78-000457 Menasveta, P.; Siriyong, R. MERCURY CONTENT OF SEVERAL PREDACIOUS FISH IN THE ANDAMAN SEA. Mar. Pollut. Bull. 8 (9): 200-204. Sept. 1977. SFA 23(1)
[Dep. Mar. Sci., Fac. Sci., Chulalongkorn Univ., Bangkok, Thailand] During April 1975 thirty-six muscle samples of six predacious species of fish from the Andaman sea were collected for an analysis of their total mercury concentrations. the total mercury levels ranged from 0.026 to 0.234 ppm in yellowfin tuna (/Neothunnus albacora/), from 0.027 to 0.233 ppm in bigeye tuna (/Parathunnus sibi/), and from 0.057 to 0.478 ppm in four species of shark. Statistical analysis also showed positive linear regression and there was correlation between the mercury concentration and the weight of the yellowfin tuna, bigeye tuna, and shark. The rates of total mercury accumulation in yellowfin and bigeye tuna were not significantly different. A comparsion between the total mercury level in the Andaman yellowfin and the Central Pacific yellowfin tuna is discussed.

78-000458 Otake, S.; Fukui, K.; Teraoka, K.; Yoshida, H. [ELECTROCOAGULATING TREATMENT OF WASTE WATER FROM FISH PASTE-MANUFACTURING FACTORIES.] Bull. Jpn. Soc. Sci. Fish. 43 (8): 975-981. Aug. 1977. In Japanese with English summ. SFA 23(1)
[Coll. Agric. Vet. Med., Nihon Univ., Shimouma, Setagaya-ku, Tokyo, Japan]

78-000459 Patrick, W. H., Jr.; Gambrell, R. P.; Khalid, R. A. PHYSIOCOCHEMICAL FACTORS REGULATING SOLUBILITY AND BIOAVAILIABILITY OF TOXIC HEAVY METALS IN CONTAMINATED DREDGED SEDIMENT. J. Environ. Sci. Health A Environ. Sci Eng. 12 (9): 475-492. 1977. SFA 23(1)
[Cent. Wetland Resour., La. State Univ., Baton Rouge 70803]

78-000460 Penczak, T.; Zalewski, M.; Molinski, M.; Gajos, M. THE ECOLOGY OF ROACH, /RUTILUS RUTILUS/ (L.), IN THE BAREEL REGION OF THE POLLUTED PILICA RIVER. IV. ELEMENTS OF PRODUCTION AND FOOD CONSUMPTION. Ekol. Pol. 25 (2): 241-255. 1977. In English with Polish summ. SFA 23(1)
[Dep. Comp. Anat. Anim. Ecol., Inst. Environ. Biol., Univ. Lodz, Poland] Two populations of roach /Rutilus rutilus/ (L.) were examined in the sections of the Pilica river belonging to the II and III class of water purity. Higher sewage concentration by one class still enables the existence of mature fish, but limits by 2/3 the production, food consumption and energy demand of population. Lack of fish from the age group 0+ on the site where the water belongs to the III class shows that there are no conditions for the species reproduction, and the fish swim there from other river parts in order to get food.

78-000461 Perry, J. A. PESTICIDE AND PCB RESIDUES IN THE UPPER SNAKE RIVER ECOSYSTEM, SOUTHEASTERN IDAHO, FOLLOWING THE COLLAPSE OF THE TETON DAM 1976. Idaho Dep. Health Welfare, Pocatello 27p. Sept. 1977. SFA 23(1)
[Idaho Dep. Health Welfare, Div. Environ., 636 Pershing, Pocatello 83201]

78-000462 Phillips, D. J. H. THE USE OF BIOLOGICAL INDICATOR ORGANISMS TO MONITOR TRACE METAL POLLUTION IN MARINE AND ESTUARINE ENVIRONMENTS--A REVIEW. Environ. Pollut. 13 (4): 281-317. Aug. 1977. SFA 23(1)
[Dep. Zool., Uppsala, Sweden]

78-000463 Poulin, J. W. WHO CONTROLS LOW-LEVEL RADIOACTIVE WASTES. Environ. Aff. 6 (2): 201-225. 1977. SFA 23(1)
[Environ. Aff., Inc., Boston Coll. Law Sch., Newton Centre, MA 02159]

78-000464 Ryan, P. M.; Harvey, H. H. GROWTH OF ROCK BASS, /AMBLOPLITES RUPESTRIS/, IN RELATION TO THE MORPHOEDAPHIC INDEX AS AN INDICATOR OF AN ENVIRONMENTAL STRESS. J. Fish. Res. Board Can. 34 (11):2079-2088. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

78-000465 Sodergren, S. ECOLOGICAL EFFECTS OF HEAVY METAL DISCHARGE IN A SALMON RIVER. Rep. Inst. Freshwater Res. Drottinghclm No. 55. p. 91-131. 1976. SFA 23(1)
[Sect. Ecol. Zool., Dep. Biol., Univ. Umea, S-901 87 Umea, Sweden]

78-000466 Starnes, L. B. COMPARISON OF FISH AND BENTHIC FAUNAL COMPOSITIONS IN POLLUTED AND PRISTINE FORKS OF A MOUNTAIN RIVER. Tenn. Wildl. Resour. Agency Fish. Res. Rep. 77-55. 102p. 1977. SFA 23(1)
[TVA, FF&WD, Norris, TN 37828] The Little Pigeon River in Sevier County, Tennessee presents a near ideal situation for the study of the effects of domestic sewage on species composition in a mountain river. The Little Pigeon system has two principal components, the West and Middle Prongs. The West Prong is polluted by municipal effluent from Gatlinburg and Pigeon Forge, while the Middle Prong remains relatively pristine. Physiographically, the two prongs are strikingly similar. The great similarity of natural physical and chemical water quality parameters presents an opportunity to use the pristine prong as a control for the study of changes, probably resulting from pollution, in the other. Fish and aquatic invertebrates were sampled from riffle communities of both streams, and their composition was analyzed to gain insight into possible changes in the West Prong due to pollution. There were drastic differences in benthic invertebrates and observable differences in the fish faunal assemblages. These differences suggest that strong shifts in species composition as well as a sharp decline in population density of many invertebrates and some fish species had resulted in the West Prong due to pollution. It is speculated that these shifts were caused by organic solids.

78-000467 Thomas, J. L. WATER REQUIREMENTS AND WASTEWATER POTENTIAL OF COAL-ENERGY FACILITIES. Proc. Fort Union Coal Field Symp. Vol. 2. 179-190. Apr. 1975. SFA 23(1)
[Mont. Water Qual. Bur., Billings]

78-000468 Ueda, T.; Takeda, M. [ON MERCURY AND SELENIUM CONTAINED IN TUNA FISH TISSUES-IV. METHYL MERCURY LEVEL IN MUSCLES AND LIVER OF YELLOWFIN TUNA.] Bull. Jpn. Soc. Sci. Fish. 43 (9): 1115-1121. Sept. 1977. In Japanese with English summ. SFA 23(1)
[Dep. Food Sci. Technol., Shimonoseki Univ. Fish,, Shimonoseki, Japan]

78-000469 Vermeer, K.; Peakall, D. B. TOXIC CHEMICALS IN CANADIAN FISH-EATING BIRDS. Mar. Pollut. Bull. 8 (9): 205-210. Sept. 1977. SFA 23(1)
[Can. Wildl. Serv., 5421 Robertson Rd., Delta, BC V4K 3N2, Canada] Cross-country comparison of DDE and PCB residue levels in cormorant, gull and tern eggs in Canada reveal that bird populations at the Great Lakes are most contaminated with those pollutants. DDE levels have been correlated with reproductive failure in Double-crested Cormorants in the Great Lakes with eggshell thinning as a major factor. Low reproductive success in Herring Gull colonies at Lake Ontario is associated with high chlorinated hydrocarbon levels in eggs. Fish-eating birds in the Wabigoon River system, northwestern Ontario, are among the most known mercury contaminated birds. It is suggested that the effects of mercury on the reproduction of fish-eating birds should be further examined there. Fish-eating birds occupy the highest levels of the food web and magnification of toxic chemicals through prey organisms in this web makes those birds vulnerable to the effects of environmental contaminants. Since fish-eating birds are present everywhere in Canada's freshwater and marine habitats and occupy various niches there, they may serve as pollution indicators in various food chains of our aquatic environment. Colonial birds are especially valuable indicators as pollution effects on total bird populations can be studied. Baseline information on fish-eating bird populations should now be collected everywhere in Canada for measuring present and future effects of environmental pollutants, as well as other man-made disturbances on their populations.

78-000470 Wildish, D. J.; Akagi, H.; Poole, N. J. AVOIDANCE BY HERRING OF DISSOLVED COMPONENTS IN PULP MILL EFFLUENTS. Bull. Environ. Contam. Toxicol. 18 (5): 521-525. Nov. 1977. SFA 23(1)
[Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

78-000471 Young, D. R.; McDermott-Ehrlich, D.; Heesen, T. C. SEDIMENTS AS SOURCES OF DDT AND PCB. Mar. Pollut. Bull. 8 (11): 254-257. Nov. 1977. SFA 23(1)
[South. Calif. Coastal Water Res. Prog., 1500 E. Imperial Hwy., El Sequendo 90245] Despite major decreases in DDT and PCB emissions over a three year period by the dominant discharger to a coastal marine site, only minor (and very similar) decreases were observed in concentrations of these pollutants in bottom sediments and flatfish from the outfall monitoring zone. These results illustrate how persistant such chlorinated hydrocarbons can be in the marine environment once the bottom sediments have been contaminated.

TOXICOLOGY; BIOASSAYS

78-000472 Abbott, O. J. THE TOXICITY OF AMMONIUM MOLYBDATE TO MARINE INVERTEBRATES. Mar. Pollut. Bull. 8 (9): 204-205. Sept. 1977. SFA 23(1)

[Dep. Biol., Univ. Strathclyde Mar. Lab., The Fort, Kilcreggan, Helensburgh, Dunbartonshire, Scotland] Molybdenum occurs naturally in seawater as molybdate ion, but little is known of its effects, at elevated concentrations, upon marine organisms. The toxicity of ammonium molybdate, a constituent of some industrial wastes, to marine invertebrates has now been tested. It proves to be not very toxic.

78-000473 Adams, W. J. THE TOXICITY AND RESIDUE DYNAMICS OF SELENIUM IN FISH AND AQUATIC INVERTEBRATES. Ph.D. dissertation, Mich. State Univ. 121p. 1976. From Diss. Abstr. Int. B Sci. Eng. 37(6), 1976. SFA 23(1)

Selenium concentrations in water, sediment, zooplankton and fish from the western basin of Lake Erie were determined by spectrophotometric procedures. The average concentration of selenium (dry weight) in ten fish species ranged from 8.12 ± 1.02 ppm for sheepshead to 1.80 ± 0.12 ppm for common shiners. The selenium concentration in yellow perch increased in proportion to the length and weight of the fish. The concentrations of selenium in the fish from western Lake Erie are higher than reported for other areas of the Great Lakes and this may be attributed to the fact that western Lake Erie is heavily industrialized and a recipient of multiple waste discharges. The 48 day LC50 values for sodium selenate and sodium selenite were 2.0 mg/l and 1.1 mg/l, respectively, with fathead minnows. The comparative 48 day LC50 values for sodium selenite with bluegills and rainbow trout were 0.40 mg/l and 0.50 mg/l. The 96 day LC50 value for rainbow trout exposed to sodium selenite was 0.28 mg/l. Coho salmon larvae appeared to be more sensitive to sodium selenite than other species of fish as indicated by the 48 day LC50 value of 0.16 mg/l. The 96 hour LC50 for sodium selenate with /Hyallela azeteca/ was 0.76 mg/l. The hatchability of fathead minnow eggs exposed to sodium selenite at concentrations of 1-40 mg/l was unaffected, however, the eggs hatched prematurely at concentrations greater than 15 mg/l and the median survival time of the resulting fry was reduced at all concentrations. The uptake of selenium by fathead minnows exposed to 10, 25 and 50 ug/l Se occurred in a curvilinear manner with a rapid period of accumulation during the first 8 days followed by a slower rate of accumulation over the next 88 days.--From abstr.

78-000474 Balayev, L. A.; Mazmanidi, N. D.; Bazhashvili, T. R. THE REACTIONS OF SOME BLACK SEA ORGANISMS IN AN ELECTRIC FIELD EXPOSED TO DISSOLVED PETROLEUM PRODUCTS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 647-652. 1976. SFA 23(1)

[VNIRO, Moscow, USSR] On the basis of a study of three responses (primary, anode, electric shock) of some Black Sea organisms in an electric field exposed to dissolved petroleum products, it was established that they are all to some extent sensitive to such poisoning and that in fishes the degree of sensitivity is related to ecological groupings.

78-000475 Blaxter, J. H. S. THE EFFECT OF COPPER ON THE EGGS AND LARVAE OF PLAICE AND HERRING. J. Mar. Biol. Assoc. U.K. 57 (3): 849-858. Aug. 1977. SFA 23(1)
[Dunstaffnage Mar. Res. Lab., Oban, Scotland] Newly-hatched larvae of plaice (/Pleuronectes platessa/ L.) showed a high mortality in 1000 ug/l and older larvae in 300 ug/l copper. Newly-hatched larvae of herring (/Clupea harengus/ L.) also showed high mortality in 1000 ug/l. The eggs of herring were much more sensitive, mortality being high even in 30 ug/l. Sub-lethal effects of copper on feeding of plaice were evident at about 1000 ug/l in young feeding larvae but as low as 90 ug/l in older feeding larvae. Feeding by yolk-sac plaice was totally inhibited by as little as 90 ug/l copper. Growth and differentiation were retarded in feeding plaice larvae at 90-300 ug/l copper. The activity of herring larvae, as shown by a laboratory-scale vertical migration, was impaired in 300 ug/l copper.

78-000476 Brekke, O. L.; Sinnhuber, R. O.; Peplinski, A. J.; Wales, J. H.; Putnam, G. B.; Lee, D. J.; Ciegler, A. AFLATOXIN IN CORN: AMMONIA INACTIVATION AND BIOASSAY WITH RAINBOW TROUT. Appl. Environ. Microbiol. 34 (1): 34-37. July 1977. SFA 23(1)
[North. Reg. Res. Cent., Agric. Res. Serv., Peoria, IL 61604] Four samples of corn were compared with respect to their hepatocarcinogenicity in rainbow trout. One corn sample was found by chemical analysis to contain no detectable aflatoxin. A second sample was contaminated with aflatoxins at a level of 180 ug/kg. Each of the above-mentioned samples was divided, and one-half of each was ammoniated. These four samples were added to a semipurified basal diet and fed to a sensitive strain of rainbow trout. It was found that ammoniation inactiviated the aflatoxins and reduced the carcinogenicity of the contaminated corn to a level that was not significantly different from that with the basal control diet. It was also found that the ammoniation process did not reduce the nutritive value of the corn.

78-000477 Burkhalter, D. E.; Kaya, C. M. EFFECTS OF PROLONGED EXPOSURE TO AMMONIA ON FERTILIZED EGGS AND SAC FRY OF RAINBOW TROUT (/SALMO GAIRDNERI/). Trans. Am. Fish. Soc. 106 (5): 470-475. Sept. 1977. SFA 23(1)
[Dep. Biol., Mont. State Univ., Bozeman 59715]

78-000478 Curtis, E. H.; Beauchamp, J. J.; Blaylock, B. G. APPLICATION OF VARIOUS MATHEMATICAL MODELS TO DATA FROM THE UPTAKE OF METHYL MERCURY IN BLUEGILL SUNFISH (/LEPOMIS MACROCHIRUS/). Ecol. Model. 3 (4): 273-284. Oct. 1977. SFA 23(1)
[Curtis & Assoc., Terre Haute, IN]

78-000479 Daye, P. G.; Garside, E. T. LOWER LETHAL LEVELS OF PH FOR EMBRYOS AND ALEVINS OF ATLANTIC SALMON, /SALMO SALAR/ L. Can. J. Zool. 55 (9): 1504-1508. Sept. 1977. SFA 23(1)
[Biol. Dep., Life Sci. Cent., Dalhousie Univ., Halifax, NS B3H 4J, Canada] Embryos and alevins of Atlantic salmon, /Salmo salar/ L., at various stages of development were subjected to several levels of low pH ranging from 4.3 to 2.7, for maximum exposures of 10,000 min in static bioassays at 5 or 6°C, after incubation from fertilization at pH 6.9-6.6 and 5.0-6.7°C. Sensitivity of the embryos and alevins to pH stress was dependent on the stage of development. Embryos in early cleavage were more sensitive to low pH than older encapsulated embryos. Alevins were more sensitive to low pH than embryos. The lower lethal limit for embryos during early cleavage was about pH 3.6, while

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for older embryos in two sequential stages just before hatch it was about pH 3.0 and pH 3.1, successively. Alevins subjected to low pH levels at 7 days and at 28 days after median hatch had a lower lethal limit of about pH 4.0.

78-000480 DeGraeve, G. M.; Ward, R. W. ACCLIMATION OF FATHEAD MINNOWS AND LAKE TROUT TO RESIDUAL CHLORINE AND BROMINE CHLORIDE. J. Water Pollut. Control Fed. 49 (10): 2172-2178. Oct. 1977. SFA 23(1)
[Grand Valley State Coll., Allendale, MI] Fathead minnows and lake trout with previous exposure (longer than 2 hours) to chlorinated or chlorobrominated effluent respectively were capable of tolerating high levels of TRC or TRBC for longer periods of time than fish that were not previously exposed to either halogen. For fathead minnows there was a linear relationship between duration of previous exposure and tolerance to residual halogen levels in excess of 96-hour TL(50) values. The acclimation of fathead minnows to TRC was most apparent after 4 or more hours of exposure to low TRC concentrations. Even after long-term exposure to sublethal levels of TRC in effluent, fathead minnows were not able to survive high TRC concentrations.-- From concl.

78-000481 Eldridge, M. B.; Echeverria, T.; Whipple, J. A. ENERGETICS OF PACIFIC HERRING (/CLUPEA HARENGUS PALLASI/) EMBRYOS AND LARVAE EXPOSED TO LOW CONCENTRATIONS OF BENZENE, A MONOAROMATIC COMPONENT OF CRUDE OIL. Trans. Am. Fish. Soc. 106 (5): 452-461. Sept. 1977. SFA 23(1)
[NMFS, Southwest Fish. Cent., Tiburon Lab., 3150 Paradise Dr., Tiburon, CA 94920]

78-000482 Ernst, V. V.; Neff, J. M.; Anderson, J. W. THE EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE EARLY DEVELOPMENT OF THE ESTUARINE FISH, /FUNDULUS GRANDIS/ BAIRD AND GIRARD. Environ. Pollut. 14 (1): 25-35. Sept. 1977. SFA 23(1)
[Dep. Biol., Tex. A&M Univ., College Station 77843] Embryos of /Fundulus grandis/ were exposed continuously to 12.5, 25 and 50 percent dilutions of the water-soluble fraction (WSF) of No. 2 fuel oil, corresponding to aqueous petroleum hydrocarbon concentrations of 1.1, 2.2 and 4.4 ppm, respectively, and aqueous naphthalenes concentrations of 0.56, 1.07 and 1.26 ppm, respectively. At different times during development, embryos were examined histologically and compared with unexposed controls. Embryos exposed to 12.5 percent WSF generally hatched earlier than the controls and most were normal. Some of those exposed to 25 percent WSF had pathological liver, kidney, lens and epithelial tissues while others appeared normal. None of the embryos exposed to 50 percent WSF hatched and all had pathological tissues.

78-000483 Fogels, A.; Sprague, J. B. COMPARATIVE SHORT-TERM TOLERANCE OF ZEBRAFISH, FLAGFISH, AND RAINBOW TROUT TO FIVE POISONS INCLUDING POTENTIAL REFERENCE TOXICANTS. Water Res. 11 (9): 811-817. 1977. SFA 23(1)
[Dep. Zool., Coll. Biol. Sci., Univ Guelph, Guelph, ON N1G 2W1, Canada] Zebrafish (/Brachydanic rerio/) and flagfish (/Jordanella floridae/) were evaluated as potential standard species for aquatic bioassays in Canada by comparing their short-term tolerance to that of rainbow trout (/Salmo gairdneri/). When threshold or 10-day LC(50)'s for rainbow trout were assigned a value of 1.0, corresponding values for zebrafish and flagfish were respectively: copper sulfate, 1.6, 7.2; sodium pentachlorophenate, 4.7, 7.6; phenol, 2.5, 3.1; picloram,

78-000483 CONTINUED
1.6, 0.55; and dodecyl sodium sulfate, 2.8, 2.4. On the average, zebrafish were 2.6 times as tolerant as trout, and flagfish 4.2 times. Ratios of zebrafish/trout LC(50)'s were considerably less variable than flagfish/trout LC(50)'s. Considering the known variable response of rainbow trout and a maximum ratio of only 7.6 for exotic/trout LC(50)'s, responses of zebrafish and flagfish were judged not sufficiently different from those of rainbow trout to discount either exotic species from further consideration as a potential standard test-fish. As a reference toxicant, sodium pentachlorophenate presented difficulties with analysis and availability. Dodecyl sodium sulfate showed no threshold of acute lethality for trout and 5-yr-old DSS had about one-third the toxicity of 1-year old DSS. Phenol met all criteria considered for a reference toxicant.

78-000484 Foulquier, L.; Grauby, G. CONTAMINATION OF THE EUROPEAN EEL (/ANGUILLA ANGUILLA/ L.) WITH ZINC-65. Sov. J. Ecol. (Engl. Transl. Ekologiya) 7 (6): 495-506. Nov.-Dec. 1977. SFA 23(1)
[Lab. Cont. Radioecol., Saint-Paul-les-Durance, France]

78-000485 Glickman, A. H.; Statham, C. N.; Wu, A.; Lech, J. J. STUDIES ON THE UPTAKE, METABOLISM, AND DISPOSITION OF PENTACHLOROPHENOL AND PENTACHLORCANISOLE IN RAINBOW TROUT. Toxicol. Appl. Pharmacol. 41 (3): 649-658. Sept. 1977. SFA 23(1)
[Dep. Pharmacol., Med. Coll. Wis., Milwaukee 53233]

78-000486 Gould, E.; MacInnes, J. R. SHORT-TERM EFFECTS OF TWO SILVER SALTS ON TISSUE RESPIRATION AND ENZYME ACTIVITY IN THE CUNNER (/TAUTOGOLABRUS ADSPERSUS/). Bull. Environ. Contam. Toxicol. 18 (4): 401-408. Oct. 1977. SFA 23(1)
[NMFS, Milford Lab., Milford, CT 06460] Short-term exposure to 0.5 ppm silver as either nitrate or acetate causes respiratory distress in the cunner. Activities of two liver enzymes indicate that the nitrate salt induces a slightly higher metabolic stress than does the acetate.--From Discussion.

78-000487 Gruber, D.; Cairns, J., Jr.; Dickson, K. L.; Hummel, R. III; Maciorowski, A.; van der Schalie, W. H. AN INEXPENSIVE, NOISE-IMMUNE AMPLIFIER DESIGNED FOR COMPUTER MONITORING OF VENTILATORY MOVEMENTS OF FISH AND OTHER BIOLOGICAL EVENTS. Trans. Am. Fish. Soc. 106 (5): 497-499. Sept. 1977. SFA 23(1)
[Cent. Environ. Stud., VPI & SU, Blacksburg, VA 24061]

78-000488 Guarino, A. M.; James, M. O.; Bend, J. R. FATE AND DISTRIBUTION OF THE HERBICIDES 2,4-DICHLOROPHENOXYACETIC ACID (2,4-D) AND 2,4,5-TRICHLOROPHENOXYACETIC ACID (2,4,5-T) IN THE DOGFISH SHARK. Xenobiotica 7 (10): 623-631. Oct. 1977.
[Lab. Toxicol., Bldg. 37-Rm. 5B22, Natl. Cancer Inst., NIH, Bethesda, MD 20014] The urinary and biliary excretion, Tissue distribution and metabolism of ^{14}C-labelled 2,4-dichloro- or 2,4,5-trichloro-phenoxyacetic acids (2,4-D or 2,4,5-T) were measured in dogfish sharks, /Squalus acanthias/. Both herbicides are extensively metabolized (greater than 90 percent) to the corresponding taurine conjugates, and are excreted predominantly via the urine, where ca. 70 percent of the administered dose appears within 4-6 days after treatment. The highest tissue levels of 2,4-D or 2,4,5-T were found in liver and kidney. Penetration of both herbicides into the CNS was restricted. Plasma elimination was rapid and the /t/(0.5) for eight phenoxyacetic acid was less than 45 min. Similarly, rapid clearance

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was seen from renal tissue. Final /t/(0.5) values for muscle were about 2-3 days while the major organ showing 2,4-D or 2,4,5-T retention was the liver, where /t/(0.5) values were about 5 days for both the herbicides. The overall pharmacokinetics in the dogfish shark for these herbicides resembled those seen in some mammals.

78-000489 Hamburger, B.; Haberling, H.; Hitz, H. R. VERGLEICHENDE PRUEFUNGEN DER FISCHTOXIZITAETEN AN ELRITZEN, FORELLEN UND GOLDORFEN. [COMPARATIVE TESTS ON TOXICITY TO FISH USING MINNOWS, TROUT AND GOLDEN ORFE.] Arch. Fischereiwiss. 28 (1): 45-55. July 1977. In German with English summ. SFA 23(1)
[BAYER AG, D-5090 Leverkusen, West Germany] Statements on the effects of chemicals on fish are required more and more frequently. For this reason, the fish species used most commonly for tests at our latitudes, the minnow (/Phoxinus laevis/), the rainbow trout (/Salmo gairdnerii/) and the golden orfe (/Leuciscus idus/ L.), which have been used very frequently over the past few years, were subjected to a comparative test by seven companies in the chemical industry. The tests were carried out with three dyestuffs, three auxiliaries and one heavy metal salt. The golden orfe were tested using a static test in line with the German proposal for testing the effect of chemicals on fish, and the trout were tested using US standard methods. The continuous test arrangement for trout followed the recommendations laid down by Alabaster, and the method submitted by the French Institut National Recherche Chimique Appliquee (IRCHA) in draft form was used for the minnows. The results of these tests indicate that minnows, trout and golden orfe normally show similar sensitivity.

78-000490 Hinz, R.; Matsumura, F. COMPARATIVE METABOLISM OF PCB ISOMERS BY THREE SPECIES OF FISH AND THE RAT. Bull. Environ. Contam. Toxicol. 18 (5): 631-639. Nov. 1977. SFA 23(1)
[Dep. Entomol., Univ. Wis., Madison 53706]

78-000491 Jarvinen, A. W.; Hoffman, M. J.; Thorslund, T. W. LONG-TERM TOXIC EFFECTS OF DDT FOOD AND WATER EXPOSURE ON FATHEAD MINNOWS (/PIMEPHALES PROMELAS/). J. Fish. Res. Board Can. 34 (11): 2089-2103. Nov. 1977. In English with French summ. SFA 23(1)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804]

78-000492 Johnson, A. G.; Willians, T. D.; Arnold, C. R. CHLORINE-INDUCED MORTALITY OF EGGS AND LARVAE OF SPOTTED SEATROUT (/CYNOSCION NEBULOSUS/). Trans. Am. Fish. Soc. 106 (5): 466-469. Sept. 1977. SFA 23(1)
[NMFS, Southeast Fish. Cent., Port Aransas Lab., Port Aransas, TX 78373]

78-000493 Johnson, W. W.; Sanders, H. O. CHEMICAL FOREST FIRE RETARDANTS: ACUTE TOXICITY TO FIVE FRESHWATER FISHES AND A SCUD. U.S. Fish Wildl. Serv. Tech. Pap. 91: 7p. 1977. SFA 23(1)
[U.S. FWS, Fish-Pestic. Res. Lab., Rt. 1, Columbia, MO 65201]
Toxicities of four chemical forest fire retardants, Fire-Trol 100 and 931 (ammonium sulfate or polyphosphate with an attapulgite clay thickener) and Phos-Chek 202 A and 259 (diammonium phosphate with a guar gum derivative thickener) were determined by static and flow-through toxicity tests for fry and fingerling coho salmon (/Oncorhynchus kisutch/) and rainbow trout (/Salmo gairdneri/); fingerling fathead minnows (/Pimephales promelas/), bluegills (/Lepomis macrochirus/), and largemouth bass (/Micropterus salmoides/);

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and mature scuds (/Gammarus pseudolimnaeus/). In static tests, Phos-Chek formulations were more toxic than either of the Fire-Trol formulations to scuds and all life stages of fish. Acute, 96-h LC(50)'s ranged from 40 mg/l for scuds to more than 1,500 mg/l for fingerling fish. In salmon and trout, fry were generally more susceptible than fingerlings to all formulations; yolk-sac fry were more susceptible than swim-up fry. Toxicities of all formulations to salmon and trout were similar at 6 and 11 C. Un-ionized ammonia is believed to be the most toxic component of these fire retardants.

78-000494 Kawatsu, H. STUDIES ON THE ANEMIA OF FISH--VIII. HEMORRHAGIC ANEMIA OF CARP CAUSED BY A HERBICIDE, MOLINATE. Bull. Jpn. Soc. Sci. Fish. 43 (8): 905-912. Aug. 1977. SFA 23(1)
[Freshwater Fish. Res. Lab., Miya, Hino-shi, Tokyo, Japan] The toxicity of the herbicide, molinate, to carp was studied. The 21-day lethal concentration for the animal was estimated at 0.18 ppm. Anemia was found in carp exposed to molinate. This anemia was characterized with a drastic decrease of RBC and Hb levels. In blood smear preparations of carp with anemia, increase in number of immature erythrocyte was observed. However, no cytopathological change was found in their erythrocytes. Microaneurysm and punctate hemorrhage were frequently observed in the gill of anemic carp. Histologically, these alterations consisted of swelling of gill lamella, dilation and PAS-positive-thickening of capillary wall, and deterioration of pillar cells. No hemosiderin was demonstrated in the spleen of carp with anemia. Thus, it is concluded that herbicide, molinate evoked anemia in carp, and this anemia was due to loss of blood resulting from the alteration of gill-capillary wall.

78-000495 Korn, S.; Hirsch, N.; Struhsaker, J. W. THE UPTAKE, DISTRIBUTION, AND DEPURATION OF ^{14}C BENZENE AND ^{14}C TOLUENE IN PACIFIC HERRING, /CLUPEA HARENGUS PALLASI/. NOAA Fish. Bull. 75 (3): 633-636. July 1977. SFA 23(1)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

78-000496 Liden, L. H.; Burton, D. T. SURVIVAL OF JUVENILE ATLANTIC MENHADEN (/BREVOORTIA TYRANNUS/) AND SPOT (/LEIOSTOMUS XANTHURUS/) EXPOSED TO BROMINE CHLORIDE- AND CHLORINE-TREATED ESTUARINE WATERS. J. Environ. Sci. Health A Environ. Sci. Eng. 12 (8): 375-388. 1977. SFA 23(1)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD 20612] Low level discharges of total residual bromine chloride (0.020-0.081 mg/l) and chlorine (0.014-0.062 mg/l) which were effective for biofouling control in a once-through steam electric generating station were not lethal to juvenile Atlantic menhaden and spot exposed continuously to the halogenated water for 19 and 20 days, respectively. Although no differences in toxicity between the two halogens was found in the study, preliminary evidence by other investigators at higher concentrations suggest that bromine chloride may be less toxic than chlorine.

78-000497 Llewellyn, G. C.; Stephenson, G. A.; Hofman, J. W. AFLATOXIN B(1) INDUCED TOXICITY AND TERATOGENICITY IN JAPANESE MEDAKA EGGS (/ORYZIAS LATIPES/). Toxicon 15 (6): 582-587. 1977. SFA 23(1)
[Va. Commonwealth Univ., Life Sci. Bldg., Richmond 23284]

78-000498 Maki, A. W. MODIFICATIONS OF CONTINUOUS-FLOW TOXICITY TEST METHODS FOR SMALL AQUATIC ORGANISMS. Prog. Fish-Cult. 39 (4): 172-174. Oct. 1977. SFA 23(1)
[Environ. Safety Dep., Proctor & Gamble Co., Ivorydale Tech. Cent., Cincinnati, OH 45217]

78-000499 Matthiessen, P. UPTAKE, METABOLISM AND EXCRETION OF THE MOLLUSCICIDE N-TRITYLMORPHOLINE BY THE TROPICAL FOOD FISH /SAROTHERODON MOSSAMBICUS/ (PETERS). J. Fish Biol. 11 (5): 497-509. Nov. 1977. SFA 23(1)
[Cent. Overseas Pest Res., College House, Wrights Lane, London W8 5SJ, England] Uptake, metabolism and excretion of radio-labelled N-tritylmorpholine (Frescon) were studied in the tropical food fish /Sarotherodon mossambicus/ (Peters). After 55 h exposure to sub-lethal solutions, concentration factors in whole fish were as high as 1300 (up to 40 mg/kg), at least 80 percent of the absorbed activity being unchanged Frescon. Approximately 40 percent of this activity was found in bone, 16 percent in muscle, 16 percent in gut and 10 percent in gill. The bile was found to be a route of Frescon excretion, and recovering fish excreted 50 percent of the absorbed activity in 55 h. The applicability of these results to the field situation is discussed.

78-000500 Melancon, M. J., Jr.; Saybolt, J.; Lech, J. J. EFFECT OF PIPERONYL BUTOXIDE ON DISPOSITION OF DI-2-ETHYLHEXYL PHTHALATE BY RAINBOW TROUT. Xenobiotica 7 (10): 633-640. Oct. 1977. SFA 23(1)
[Dep. Pharmacol., Med. Coll. Wis., Milwaukee 53233] Piperonyl butoxide /in vitro/ inhibits the oxidation and hydrolysis of di-2-ethylhexyl phthalate, and the hydrolysis of the butyl ester of 2,4-dichlorophenoxyacetic acid by liver homogenate fractions and serum from rainbow trout. The rates of oxidation and hydrolysis of di-2-ethylhexyl phthalate by liver homogenates from rainbow trout pre-exposed to piperonyl butoxide (1 mg/l) were considerably lower than those by liver homogenates from control trout. Disposition of di-2-ethylhexyl [^{14}C]phthalate in rainbow trout /In vivo/ was modified by pre-exposure to piperonyl butoxide. The piperonyl butoxide-treated trout had lower levels of ^{14}C in bile and higher levels of ^{14}C in blood and muscle than control trout. Muscle of control and piperonyl butoxide-exposed trout showed similar concentrations of mono-2-ethylhexyl phthalate but the concentration of di-2-ethylhexyl phthalate in muscle from piperonyl butoxide-exposed trout was three times the control value.

78-000501 Noel-Lambot, F.; Bouquegneau, J. M. COMPARATIVE STUDY OF TOXICITY, UPTAKE AND DISTRIBUTION OF CADMIUM AND MERCURY IN THE SEA WATER ADAPTED EEL /ANGUILLA ANGUILLA/. Bull. Environ. Contam. Toxicol. 18 (4): 418-424. Oct. 1977. SFA 23(1)
[Lab. Oceanol., Univ. Liege, 22, quai Van Benenden, 4020 Liege, Belgium]

78-000502 Oba, K.; Sugiyama, T.; Miura, K.; Morisaki, Y. [CHANGE IN FISH TOXICITY OF LAS DURING BIODEGRADATION.] Bull. Jpn. Soc. Sci. Fish. 43 (8): 1001-1008. Aug. 1977. In Japanese with English summ. SFA 23(1)

[Lion Fat & Oil Co. Ltd., 7-13-12 Hairai, Edogawa-ku, Tokyo, Japan] In case of evaluating possible effects on fish of lower levels of anionic surfactants present in the natural aquatic environment, the authors thought that it was necessary to examine the effect of LAS on Japanese killifish, /Oryzias latipes/, in a dynamic system taking account of molecular change caused by biodegradation. Considering the decrease in surfactant molecules and the changes in the distribution of the homologues and isomers of LAS (linear alkylbenzene sulfonate), the influence of LAS in the course of biodegradation on the mortality and hatchability of Japanese killifish was determined using a continuous flow river model. And the results was compared with the case of intact LAS in a static bioassay system. It was shown that biodegraded LAS was less toxic for every stage of killifish in the river model than was intact LAS in the static bioassay. The longer alkyl chain homologues and external phenyl isomers, although more toxic for fish, were more rapidly biodegraded. To evaluate the effects of easily biodegradable chemicals such as LAS present in the natural aquatic environment on aquatic organisms, the use of river models appears to be a promising new technique for the study of various environmental factors, e.g., biodegradation.

78-000503 Pascoe, D.; Mattey, D. L. STUDIES ON THE TOXICITY OF CADMIUM TO THE THREE-SPINED STICKLEBACK /GASTEROSTEUS ACULEATUS/ L. J. Fish Biol. 11 (2): 207-215. Aug. 1977. SFA 23(1)

[Dep. Appl. Biol., Univ. Wales Inst. Sci. Technol., Cathoys Park, Cardiff, Wales] Cadmium was found to be lethal to sticklebacks at all concentrations from 100.0 to 0.001 mg Cd l^{-1}, in water of 103-111 mg l^{-1} hardness as CaCO(3). The pattern of mortality as shown by the time-concentration curve suggests that toxicity is not due to a single mechanism but changes with concentration. Fish were found to accumulate cadmium, the whole body levels increasing from 0.90 ug/g fresh weight at 0.001 mg Cd l^{-1} exposure concentration to 51.0 ug/g at 100 mg Cd l^{-1}. The concentration factor was shown to decrease with increasing exposure concentration from 0.51 at 100 mg Cd l^{-1} to 511 at 0.001 mg Cd l^{-1}. The plerocercoid parasite /Schistocephalus solidus/ in the host's perivisceral cavity contained less cadmium than the tissues of its host.

78-000504 Prabhu, N. V.; Hamdy, M. K. BEHAVIOR OF MERCURY IN BIOSYSTEMS I. UPTAKE AND CONCENTRATION IN FOOD-CHAIN. Bull. Environ. Contam. Toxicol. 18 (4): 409-417. Oct. 1977. SFA 23(1)

[Dep. Food Sci., Univ. Ga., Athens 30602]

78-000505 Pruitt, G. W.; Grantham, B. J.; Pierce, R. H., Jr. ACCUMULATION AND ELIMINATION OF PENTACHLOROPHENOL BY THE BLUEGILL, /LEPOMIS MACROCHIRUS/. Trans. Am. Fish. Soc. 106 (5): 462-465. Sept. 1977. SFA 23(1)

[Lehigh Acres Development Inc., 1240 Homestead Rd., Lehigh Acres, FL 33936]

78-000506 Ruby, S. M.; Aczel, J.; Craig, G. R. THE EFFECTS OF DEPRESSED PH ON OOGENESIS IN FLAGFISH /JORDANELLA FLORIDAE/. Water Res. 11 (9): 757-762. 1977. SFA 23(1)

[Dep. Biol. Sci., Sir George Williams Campus, Concordia Univ., Montreal, PQ, Canada] Mature female flagfish /Jordanella floridae/ were continuously exposed to pH levels of 6.7, 6.0, 5.5, 5.0 and 4.5 during a 20-d period. Quantitative histological analysis of oocyte numbers in six arbitrarily assigned stages of development indicates that the ability of oocytes to form mature eggs is reduced at all pH values tested to 20.7, 15.8, 2.1 and 8.2 percent respectively, when compared with control. This reduction is primarily produced by the loss of ability of oocytes to deposit secondary yolk within the cytoplasm. At pH 4.5 both primary and secondary yolk deposition is severely affected. Retardation of oocyte growth in Stages 2, 3, 4 and 5 is evident at all pH levels below 6.7, reflecting disturbances in protein production. This technique offers a method of assessing the reproductive capcity of fish from ovaries of mature breeding adults within the population.

78-000507 Schimmel, S. C.; Patrick, J. M., Jr.; Forester, J. TOXICITY AND BIOCONCENTRATION OF BHC AND LINDANE IN SELECTED ESTUARINE ANIMALS. Arch. Environ. Contam. Toxicol. 6 (2/3): 355-363. 1977. SFA 23(1)

[U.S. EPA, Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561] Flow-through, 96-hr bioassays were conducted to determine the acute toxicity of technical BHC and lindane to several estuarine animals. Test animals and their respective 96-hr lindane LC50 values were: mysid (/Mysidopsis bahia/), 6.3 ug/L; pink shrimp (/Penaeus duorarum/), 0.17 ug/L; grass shrimp (/Palaemonetes pugio/), 4.4 ug/L; sheepshead minnow (/Cyprinodon variegatus/), 104 ug/L; and pinfish (/Lagodon rhomboides/), 30.6 ug/L. The 96-hr LC50 values for pink shrimp and pinfish exposed to BHC were 0.34 and 86.4 ug/L, respectively. Two BHC bioconcentration studies were conducted with the oyster, /Crassostrea virginica/, and pinfish. After 28 days exposure, oysters bioconcentrated an average of 218 X the BHC measured in exposure water, while pinfish bioconcentrated 130 X in their eidible tissues and 617 X in offal. After one week in BHC-free sea water, no detectable residues were measured in oyster or pinfish.

78-000508 Somero, G. N.; Chow, T. J.; Yancey, P. H.; Snyder, C. B. LEAD ACCUMULATION RATES IN TISSUES OF THE ESTUARINE TELEOST FISH, /GILLICHTHYS MIRABILIS/: SALINITY AND TEMPERATURE EFFECTS. Arch. Environ. Contam. Toxicol. 6 (2/3): 337-348. 1977. SFA 23(1)

[Scripps Inst. Oceanogr., La Jolla, CA 92093] Tissue-specific lead accumulation rates were determined in the estuarine teleost fish, /Gillichthys mirabilis/, as a function of four variables; sea water lead concentration, duration of exposure to lead, salinity, and temperature. Distinct tissue-specific accumulation rates were found. Spleen, gills, fins, and intestine accumulated the greatest amounts of lead; liver and muscle accumulated the least lead. Decay of lead from tissues of lead-exposed fish was observed only for gills, fins, and intestine, tissues which all possess an outer or inner covering of mucus. Our data suggest that the rapid turnover of lead in these mucus-covered tissues is a result of lead complexing with mucus and subsequent loss of lead when the mucus layer is sloughed off. In spleen and vertebrae, lead levels continued to rise in fish returned to natural (unspiked) sea water from lead-spiked sea water. The rate of lead accumulation was dependent on both the holding salinity and the temperature. Fish held at high temperature accumulated lead more rapidly than fish held at low temperature. The rate of lead accumulation was inversely proportional to the salinity of the medium.

78-000508 CONTINUED
Both of these environmental effects on lead accumulation rates could be significant in estuarine habitats where lead concentrations, salinity, and temperature are all apt to vary seasonally.

78-000509 Somero, G. N.; Yancey, P. H.; Chow, T. J.; Snyder, C. B. LEAD EFFECTS ON TISSUE AND WHOLE ORGANISM RESPIRATION OF THE ESTUARINE TELEOST FISH, /GILLICHTHYS MIRABILIS/. Arch. Environ. Contam. Toxicol. 6 (2/3): 349-354. 1977. SFA 23(1)
[Scripps Inst. Oceanogr., La Jolla, CA 92093] Oxygen consumption rates of whole fish and isolated gill tissue were measured using specimens of /Gillichthys mirabilis/ exposed to lead-dosed sea water for varying periods of time. Whole organism oxygen consumption was significantly higher in lead-exposed fish than in those held for equivalent periods of time in non-leaded sea water. /In vitro/ gill respiration rates were virtually identical for control and lead-exposed fish. Lead-exposed fish were also extremely more active in the aquaria than the control group. These findings suggest that lead-induced metabolic changes may derive more from lead effects on central nervous system coordination of activity and metabolism than from direct effects of lead on intermediary metabolism enzymes in each cell.

78-000510 Tagatz, M. E.; Ivey, J. M.; Moore, J. C.; Tobia, M. EFFECTS OF PENTACHLOROPHENOL ON THE DEVELOPMENT OF ESTUARINE COMMUNITIES. J. Toxicol. Environ. Health 3 (3): 501-506. Oct. 1977. SFA 23(1)
[U.S. EPA, Environ. Res. Lab., Gulf Breeze, FL] Pentachlorophenol affected the composition of communities of estuarine organisms developed in sand from planktonic larvae in estuarine water that flowed through ten control aquaria and ten aquaria per exposure concentration averaging 7, 76, or 622 ug/liter. Annelids, arthropods, and mollusks were the numerically dominant phyla when animals were collected in a 1-mm-mesh sieve after 9 wk of exposure. Mollusks were markedly fewer at 7 ug/liter; annelids and arthropods at 76 ug/liter. Almost no animals occurred at 622 ug/liter. The total numbers of individuals and species were significantly less (alpha = 0.01) in aquaria exposed to 76 ug/liter than in those unexposed or exposed to 7 ug/liter.

78-000511 Trnkova, J. DIE TOXISCHE WIRKUNG DES ENDRINS AUF AQUATISCHE WIRBELLOSE. [THE TOXICITY OF ENDRIN TO AQUATIC INVERTEBRATES.] Prirodoved Pr. Ustavu Cesk. Akad. Ved Brne 11 (3): 1-30. 1977. In German with English summ. SFA 23(1)

78-000512 Tucker, C. S.; Boyd, C. E. RELATIONSHIPS BETWEEN POTASSIUM PERMANGANATE TREATMENT AND WATER QUALITY. Trans. Am. Fish. Soc. 106 (5): 481-488. Sept. 1977. SFA 23(1)
[Dep. Fish. Allied Aquaculture, Agric. Exp. Stn., Auburn Univ., Auburn, AL 36830]

78-000513 Wohlgemuth, E. TOXICITY OF ENDRIN TO SOME SPECIES OF AQUATIC VERTEBRATES. Prirodoved. Pr. Ustavu Cesk. Akad. Ved brne 11 (6): 1-38. 1977. SFA 23(1)

The author carried out experiments with endrin toxicity for aquatic vertebrates in the period 1972-1975. Its toxicity was studied in both commercial and coarse fish species, /viz./, /Coregonus lavaretus/, /Coregonus peled/, /Salmo gairdneri/, /Carassius carassius/, /Tinca tinca/, /Leucaspius delineatus/, /Gobio gobio/, and /Stizostedion lucioperca/. The species /Poecilia reticulata/ was used as a model object for comparative tests. Of /Amphibia/, the tadpoles of /Rana temporaria/ were investigated. Results obtained indicate equivocally a high toxicity of endrin to fish. LC(50) values ranged from 10^{-2} to 10^{-4} mg per litre. Members of the family /Cyprinidae/ showed a lower sensitiveness than those of the family /Salmonidae/. Of the fish investigated, /Carassius carassius/ showed the highest resistance (LC(50)/72 hours 0.0283 mg per litre) while /Salmo gairdneri/ the lowest one (LC(50)/72 hours 0.00006 mg per litre). Eleuterembryos were more resistant than other developmental stages. Toxicity of endrin increased with increasing temperature. Results obtained with the model species indicated toxic effects of a short-time exposition. In fish, the half-life of endrin biological activity was 8.3 days. In tadpoles of /Rana temporaria/ the values of LC(50)/72 hours were 10^{-2} mg per litre and the sensitiveness of the animals increased during the ontogenetic development. As endrin shows very toxic effects upon aquatic vertebrates, it may be concluded that the life of these animals may be seriously endangered also by rinsing barrels containing this compound and by the wash-off of endrin from treated areas.

78-000514 Yamamoto, Y.; Ishii, T.; Sato, M.; Ikeda, S. [EFFECT OF DIETARY ASCORBIC ACID ON THE ACCUMULATION OF COPPER IN CARP.] Bull. Jpn. Soc. Sci. Fish. 43 (8): 989-993. Aug. 1977. In Japanese with English summ. SFA 23(1)

[Dep. Fish, Fac. Agric., Kyoto Univ., Kyoto, Japan] This paper deals with the effect of dietary L-ascorbic acid (AsA) on the accumulation of copper in tissues of carp exposed to the copper solution at a level of 0.05 ppm for 9 weeks. The copper content in the hepatopancreas of carp fed the AsA-supplemented diet significantly decreased as compared to that of carp fed the AsA-free diet. Prevention of copper accumulation by AsA intake was also observed in the gills, kidney, intestine and vertebrae. The AsA content in the hepatopancreas was reduced in proportion to the amount of accumulated copper. Further, The accumulation of copper in the hepatopancreas caused a decrease in the hepatic L-gulonolactone oxidase activity. These results indicated that AsA prevents the accumulation of copper and that accumulated copper decreases the AsA level in the hepatopancreas by inhibiting the biosynthesis of AsA in carp.

78-000515 Yang, C.-F.; Sun, Y.-P. PARTITION DISTRIBUTION OF INSECTICIDES AS A CRITICAL FACTOR AFFECTING THEIR RATES OF ABSORPTION FROM WATER AND RELATIVE TOXICITIES TO FISH. Arch. Environ. Contam. Toxicol. 6 (2/3): 325-335. 1977. SFA 23(1)

[Taichung Hsien, Taiwan 431, Republic of China] Loaches, /Misgurnus anguillicaudatus/ (Cantor), a common fish in Taiwan, were treated with DDT, dieldrin, and monocrotophos by continuous exposure in aqueous solutions (or suspensions) and by injection. DDT and dieldrin were 150 and 220 times more toxic, respectively, than monocrotophos, to the fish exposed in aqueous solutions (24-hr LC(50)), but only 1/9 and 1/4 as toxic as monocrotophos by injection (24-hr LD(50)). Results of GLC analyses indicate that, at the end of 24-hr exposure, 96.5 percent of DDT, 92.7 percent of dieldrin, and 14.3 percent of monocrotophos were absorbed by loaches from aqueous solutions. The initial rates of

78-000515 CONTINUED
absorption for DDT and dieldrin were about 10 to 20 times faster than that for monocrotophos. The large differences in relative toxicity may be due to partition distribution which in turn caused differences in absorption, as DDT and dieldrin are lipophilic and monocrotophos is hydrophilic. Statistical analysis of the relationship between fish toxicities and partition coefficients supports the present finding. The coefficient of correlation is 0.70 between partition coefficients (benzene/water) and toxicities to fish (rainbow trout) of 12 organophosphorus insecticides, 0.74 between coefficients and corrected fish toxicities, and 0.96 between partition coefficients and corrected fish toxicities for organophosphates only. Results of analyses are significant at less than 1 percent probability level. Similar correlation was also obtained between partition coefficients for hexane/water and toxicities of 8 organophosphorus and 5 organochlorine insecticides to rainbow trout.

78-000516 Yasumoto, T.; Nakajima, I.; Bagnis, R.; Adachi, R. FINDING OF A DINOFLAGELLATE AS A LIKELY CULPRIT OF CIGUATERA. Bull. Jpn. Soc. Sci. Fish. 43 (8): 1021-1026. Aug. 1977. SFA 23(1)
[Lab. Food Hygiene, Fac. Agric., Tohoku Univ., Sendai, Japan] Experiments were designed to see whether a dinoflagellate, /Diplopsalis/ sp. /nov/, found in a toxic sample of detritus collected from a ciguatera-endemic area is the cause of ciguatera. The dinoflagellate in the detritus was separated from other materials by means of sedimentation and sieving through sieves of various mesh sizes. Bioassay of the dinoflagellate-rich samples thus obtained proved that the toxicity of each sample was proportionally related to the number of the dinoflagellate cells in the sample. Subsequent extraction of the dinoflagellate sample followed by fractionation of the extracts with solvents afforded two major toxins: a diethyl ether soluble toxin and an acetone precipitable toxin. The former toxin was judged to be identical, or closely related, to ciguatoxin, a major toxin in ciguatera, on the basis of various column and thin layer chromatographic properties. A close similarity was also observed between the acetone precipitable toxin and maitotoxin, a secondary toxin isolated from ciguateric surgeonfish. Judging from these results, it was concluded that /Diplopsalis/ sp. /nov/ is very likely to be the cause of ciguatera.

78-000517 Yasumoto. T.; Bagnis, R.; Thevenin, S.; Garcon, M. A SURVEY OF COMPARATIVE TOXICITY IN THE FOOD CHAIN OF CIGUATERA. Bull. Jpn. Soc. Sci. Fish. 43 (8): 1015-1019. Aug. 1977. SFA 23(1)
[Lab. Food Hygiene, Fac. Agric. Tohoku Univ., Sendai, Japan] In order to elucidate the transmission of ciguatoxin through the food chain and thus determine the primary source of the toxin, fish and molluscs of various feeding habits were collected from three ciguatera-endemic areas of French Polynesia. The specimens included carnivores, herbivores, surface grazers, coral feeders, sediment feeders, and filter feeders. Despite such diversity in feeding habits, all the fish specimens were more or less toxic by our screening method for ciguatoxin. The molluscs were non-toxic. Subsequent tests on the diets of these fish disclosed strong toxicity in a sample consisting of algae and detritus collected from the surface of dead coral of the Gambier Islands. Microscopic observation revealed the presence of a large number of a species of dinoflagellate in this sample. Comparison of similar samples from other places indicated that the dinoflagellate might be the cause of the toxicity.

FISH TOXICANTS

78-000518 Houf, L. J.; Campbell, R. S. EFFECTS OF ANTIMYCIN A AND ROTENONE ON MACROBENTHOS IN PONDS. U.S. Fish Wildl. Serv. Invest. Fish Control 80. 29p. 1977. SFA 23(1)
[Sch. Forestry Fish. Wildl., Mo. Coop. Fish. Res. Unit, Univ. Mo., Columbia 54601] Samples of macrobenthos, collected over a 14-month period from nine 0.03-ha experimental ponds at the Fish-Pesticide Research Laboratory, Columbia, Missouri, were analyzed to determine the long- and short-term effects of antimycin A and rotenone. The ponds were characterized by an abundance of bushy pondweed (/Najas guadalupensis/) and by the absence of fish. Treatment concentrations of 0.5 mg/l of rotenone and 20 ug/l of antimycin and concentrations of 2.0 mg/l of rotenone and 40 ug/l of antimycin were applied. There were no effects on species diversity, emergence, seasonal dynamics, abundance, or relative numbers of taxa that could be attributed to either toxicant. Periods of spring emergence, summer buildup, and fall emergence of insects were closely associated with the seasonal development and decline of vegetation.

78-000519 Jacobi, G. Z.; Degan, D. J. AQUATIC MACROINVERTEBRATES IN A SMALL WISCONSIN TROUT STREAM BEFORE, DURING, AND TWO YEARS AFTER TREATMENT WITH THE FISH TOXICANT ANTIMYCIN. U.S. Fish Wildl. Serv. Invest. Fish Control 81. 24p. 1977. SFA 23(1)
[Coll. Nat. Resour., Univ. Wis., Stevens Point 54481] Benthos and benthic drift were sampled periodically in Seas Branch Creek (Vernon County, Wisconsin) for 5 months before and for 2 years after the stream was treated with antimycin, and over the same period in nearby untreated Maple Dale Creek. During treatment on 4 October 1972, antimycin concentrations varied from 17 to 44 ug/l at the two sampling stations in Seas Branch Creek. Populations of macroinvertebrates were drastically reduced 2 days after treatment, but all common taxa identified before treatment were present in the stream 1 year later. Estimated biomass reductions of living organisms 2 days after treatment were as high as 50 percent for one caddis fly, /Hydropsyche/ sp., and 75 percent for another, /Brachycentrus americanus/; 70 percent for a crane fly, /Antocha/ sp.; and nearly 100 percent for a mayfly, /Baetis cingulatus/, and a scud, /Gammarus pseudolimnaeus/. Summer biomass of /Antocha/ and /Brachycentrus/ did not regain pretreatment levels during the second year. The mortality of the riffle beetle, /Optioservus fastiditus/, was approximately 20 percent 9 days after treatment. A crayfish, /Orconectes propinquus/, was not affected by the treatment. The biomass of /Gammarus/, /Prosimulium/ (a black fly), /Baetis/, and /Hydropsyche/ was high during both summers after treatment. After 1 year, and continuing into the second year, total benthic biomass approached or exceeded that before treatment.

78-000520 Lee, G. F.; Hughes, R. A.; Veith, G. D. EVIDENCE FOR PARTIAL DEGRADATION OF TOXAPHENE IN THE AQUATIC ENVIRONMENT. Water Air Soil Pollut. 8 (4): 479-484. Oct. 1977. SFA 23(1)
[Cent. Environ. Stud., Univ. Texas, Richardson 75080] Bioassay of toxaphene residue from lake sediments with bluegills showed that its toxicity was reduced compared to the toxicity of the original formulation added to the lake for rough fish control approximately 10 months before. It is concluded from these observations that commercial toxaphene formulation is somewhat detoxified in the aquatic environment.

78-000521 Mayer, F. L.; Mehrle, P. M. TOXICOLOGICAL ASPECTS OF TOXAPHENE IN FISH: A SUMMARY. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 365-373. 1977. SFA 23(1)
[U.S. FWS, Fish-Pesticide Res. Lab., Columbia, MO]

78-000522 Mayer, F. L., Jr.; Mehrle, P. M., Jr.; Dwyer, W. P. TOXAPHENE: CHRONIC TOXICITY TO FATHEAD MINNOWS AND CHANNEL CATFISH. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-77-069. ix + 39p. June 1977. SFA 23(1)
[U.S. FWS, Fish-Pesticide Res. Lab., Columbia, MO 65201] Fathead minnows (/Pimephales promelas/) and channel catfish (/Ictalurus punctatus/) were continuously exposed to several toxaphene concentrations (13-630 ng/l) in flow-through diluter systems for 8 to 10 months. Growth and backbone quality of adult fathead minnows were decreased at 97 and 173 ng/l exposures, but adult channel catfish were not affected by toxaphene. Effects on reproduction were observed only in channel catfish in the 630 ng/l concentration: the period from pairing to spawning was increased and the amount of gelatinous matrix surrounding the eggs was reduced. Survival of fathead minnows was not affected by toxaphene, but the no-effect concentration for fry growth and bone quality was below 54 and 97 ng/l, respectively. Channel catfish fry survival and growth were reduced in the 299 and 630 ng/l exposures, and bone quality was altered in concentrations as low as 72 ng/l. The maximum toxaphene accumulation from water to fish was 69,000 times in fathead minnows and 50,000 times in channel catfish. Toxaphene was excreted very slowly in both species.

RESEARCH AND MANAGEMENT-GENERAL

78-000523 Atlantic State Marine Fisheries Commission; Gulf States Marine Fisheries Commission; Pacific Marine Fisheries Commission A REPORT TO THE CONGRESS. EASTLAND FISHERIES SURVEY. NOAA Grant No. 04-5-158-68. iii + 91p. May 1977. SFA 23(1)
[Atl. States Mar. Fish. Comm., 1717 Massachusetts Ave., NW, Washington, DC 20036]

78-000524 Berryman, J. H. TOWARD EXPANDED PROGRAM SUPPORT: A NATIONAL APPROACH TO FISH AND WILDLIFE EXTENSION EDUCATION. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 351-363. 1977. SFA 23(1)
[U.S. FWS, Washington, DC]

78-000525 Colby, P. J.; Wigmore, R. H. , (eds.) PROCEEDINGS OF THE 1976 PERCID INTERNATIONAL SYMPOSIUM (PERCIS). J. Fish. Res. Board Can. 34 (10): 1445-1999. Oct. 1977. SFA 23(1)
[Ontario Minist. Nat. Resour., Fish Wildl. Res. Br., Thunder Bay, ON P7C 5G6, Canada]

78-000526 Lindberg, G. U. LEV SEMENOVICH BERG AS ICHTHYOLOGIST (ON THE CENTENARY OF HIS BIRTH). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 653-656. 1976. SFA 23(1)

78-000527 Parenteau, P. A. UNFULFILLED MITIGATION REQUIREMENTS OF THE FISH AND WILDLIFE COORDINATION ACT. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 179-184. 1977. SFA 23(1)
[Natl. Wildl. Fed., Washington, DC]

78-000528 Plosila, D. S. A LAKE TROUT MANAGEMENT PROGRAM FOR NEW YORK STATE. N.Y. State Dep. Environ. Conserv. Bur. Fish. 68p. Apr. 1977. SFA 23(1)
[N.Y. State Dep. Environ. Conserv., Bur. Fish., Albany]

78-000529 Prentice, J. A.; Clark, R. D., Jr.; Carter, N. E. WALLEYE ACCEPTANCE--A NATIONAL VIEW. Fisheries (Bull. Am. Fish. Soc.) 2 (5): 15-17. Sept.-Oct. 1977. SFA 23(1)
[Tex. Parks Wildl. Dep., Heart of the Hills Res. Stn., Ingram] A questionnaire was sent to 49 state conservation agencies to aid in answering administrative questions concerning the merits of the Texas walleye (/Stizostedion vitreum vitreum/) fishery program. Agencies reported that generally sportsmen had high regard for walleye and walleye programs had administrative support. Walleye were considered valuable as sport/food fish. They also increased creel diversity, occupied areas of reservoirs underutilized by other predator fishes and added predatory pressure on undesirable fishes. Their main disadvantage was low catch rate by inexperienced fisherman.

78-000530 Williams, J. E. OBSERVATIONS ON THE STATUS OF THE DEVIL'S HOLE PUPFISH IN THE HOOVER DAM REFUGIUM. U.S. Dep. Interior Bur. Reclamation Rep. REC-ERC-77-11. 15p. Sept. 1977. SFA 23(1)
[Dep. Biol. Sci., Univ. Nev., Las Vegas] In October 1972, a multiagency effort at establishing a second population of the endangered Devil's Hole Pupfish, /Cyprinodon diabolis/, was initiated with the transplanting of 27 fish into a refgium below Hoover Dam, Clark County, Nev. From October 1975 through March 1977, the first concentrated effort at examining the dynamics of this transplanted population was undertaken. About four or more generations of pupfish have now been produced in the refugium, establishing it as the species' second population. Population fluctuations correspond well with those observed in the fishes original habitat, with the highest numbers occurring in late summer and early fall and the lowest levels in late winter. Morphometric measurements showed an increase in standard length of the fish in the transplanted population, as well as significant differences in four of six other measurements taken. Meristic data, appearing less susceptable to change, showed insignificant variation between the transplanted population and the one in Devil's Hole. The Hoover Dam refugium, while proving to be an adequate environment for survival, and even reproduction, of /Cyprinodon diabolis/, fails to provide conditions equal to those existing in the fishes natural habitat, Devil's Hole. The presence of predatory dragonfly larvae may become an important factor in the refugium.

ADMINISTRATION AND PLANNING

78-000531 Gross, R.; Underhill, A. H. STATE COMPREHENSIVE OUTDOOR RECREATION PLANS AS A VEHICLE FOR FISH AND WILDLIFE PLANNING. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 203-206. 1977. SFA 23(1)
[U.S. Bur. Outdoor Recreation, Washington, DC]

78-000532 Martin, R. G. TRENDS IN ANGLING PRESSURE AND LICENSE SALES. Fisheries (Bull. Am. Fish. Soc.) 2 (4): 30-31. July-Aug. 1977. SFA 23(1)
[Sport Fishing Inst., Suite 801, 608-13th St., NW, Washington, DC 20005]

78-000533 Sullivan, C. R. SALARIES OF FISHERIES BIOLOGISTS (JUNE 1977) IN THE UNITED STATES AND CANADA. Fisheries (Bull. Am. Fish. Soc.) 2 (5): 2-4. Sept.-Oct. 1977. SFA 23(1)
[Am. Fish. Soc., 5410 Grosvenor Lane, Bethesda, MD 20014]

REPORTS OF FISHERY STATIONS, STATES, ETC.

78-000534 Arnold, D. E.; Storm, G. L. COOPERATIVE RESEARCH UNITS FISHERY AND WILDLIFE ANNUAL REPORT 1975-76. U.S. Dep. Interior Fish Wildl. Serv. iv + 332p. 1977. SFA 23(1)
[U.S. Dep. Inter., U.S. Fish Wildl. Serv., Washington, DC 20240]

78-000535 International Commission for the Northwest Atlantic Fisheries INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES ANNUAL REPORT. Int. Comm. Northwest Atl. Fish Annu. Rep. 26. 139p. 1976. SFA 23(1)
[Dartmouth, NS, Canada]

78-000536 National Marine Fisheries Service REPORT OF THE NATIONAL MARINE FISHERIES SERVICE FOR THE CALENDAR YEAR 1976. U.S. Dep. Comm. Natl. Mar. Fish. Serv. Annu. Rep. iv + 40p. 1977. SFA 23(1)
[U.S. Dep. Comm., NMFS, Washington, DC]

HABITAT ALTERATION

78-000537 Anderson, B. A STUDY OF THE IMPACTS OF REDUCED STREAMFLOWS IN THE MIDDLE AND LOWER YELLOWSTONE BASIN. Proc. Fort Union Coal Field Symp. Vol. 2. 226-232. Apr. 1975. SFA 23(1)
[Dep. Nat. Resour. Conserv., Water Resour. Div., Helena, MT 59601]

78-000538 Buchanan, T. M. AN EVALUATION OF THE EFFECTS OF DREDGING WITHIN THE ARKANSAS RIVER NAVIGATION SYSTEM. Final Rep. to U.S. Army Corps Eng. Contract No. DACW03-74-C-0146. xiii + 277p. 1976. SFA 23(1)
[Dep. Biol., Westark Community Coll., Fort Smith, AR]

78-000539 Forshage, A.; Bonn, T. D. IMPROVED HABITAT MEANS BETTER FISHING. Tex. Parks Wildl. 35 (11): 8-11. Nov. 1977. SFA 23(1)
[Texas Parks Wildl. Dep., John H. Reagan Bldg., Austin 78701]

78-000540 Gore, J. A. RESERVOIR MANIPULATIONS AND BENTHIC MACROINVERTEBRATES IN A PRAIRIE RIVER. Hydrobiologia 55 (2): 113-123. 18 Aug. 1977. SFA 23(1)
[Dep. Zool., Univ. Mont., Missoula 59801] Samples were taken on the Tongue River, Montana, USA, during 1974 and 1975 to determine the distributions and abundances of the benthic fauna after various reservoir manipulations. The upper cold water section, influenced by hypolimnial discharge from the Tongue River Reservoir, was impoverished in insect fauna and dominated by the molluscs /Physa/ and /Sphaerium/. The lower warm water sections of the river contained two communities determined primarily by turbidity and periphyton cover. The upper warm water area was dominated by /Strophopteryx/ and hydropsychid caddis larvae. The lower river was dominated by /Cheumatopsyche/. The summer fauna, in the warm water area, was dominated by short-lived mayfly species. During the summer, 1975, the cold water section was invaded by many insects due to warming of the area when no hypolimnion was fromed in the reservoir. Invasion was apparently due to increased thermal fluctuations which caused diapause eggs to hatch and influenced the upstream migration of older nymphs and larvae. Results of drift and distributional samples after closure of the Tongue River Reservoir Dam for repairs showed that massive drift of all invertebrates began at a discharge of 130 c.f.s. (3.68 m^3/sec), a drop from 190 c.f.s. (3.38 m^3/sec) over a period of three days. Community composition was radically altered by reduced discharge.

78-000541 Gregg, R. E. ECOLOGY OF /MYSIS RELICTA/ IN TWIN LAKES, COLORADO. Bur. Reclam. Rep. REC-ERC-76-14. 222 + 7Cp. Dec. 1976. SFA 23(1)
[Colo. Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins 80523] The Mt. Elbert Pumped-Storage Powerplant at Twin Lakes, Colo., is a major feature of the Bureau's Fryingpan-Arkansas Project. Twin Lakes are oligotrophic lakes of glacial origin located in the montane zone of the Rocky Mountains. The lake trout fishery at Twin Lakes is one of the best in Colorado. The major source of food for the lake trout in recent years has been /Mysis relicta/ Loven, introduced to Twin Lakes in 1957. Vertical migrations of this freshwater mysid were studied using three ring nets and a benthic sled towed simultaneously on a single cable. It was learned that migrations vary in timing and magnitude and that juveniles migrate more extensively than adults. Horizontal distribution and movements were determined from trawls taken at 17 stations monthly for 2 years. The frequency distribution of /Mysis/ per square metre was fitted to the negative binomial frequency distribution, indicating a highly clumped distribution for benthic /Mysis/. Deep and shallow water sample comparisons showed /Mysis/ prefer deeper, colder water in the summer, migrating into shallow water in the fall. studies of the effects on /Mysis/ mortality of turbulence and turbidity created by plant operation revealed that 8 hours of turbulence daily greatly increased mortalities due to exhaustion and mechanical abrasion. Whether such attrition will

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adversely affect the population is not known.

78-000542 Hazel, C. ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. PART B: CALIFORNIA. EXECUTIVE SUMMARY. U.S. Fish Wildl. Serv. FWS/OBS-76/32. xixp. Dec. 1976. SFA 23(1)
[Jones and Stokes Assoc., Inc., 2321 P St., Sacramento, CA 98816] This report contains the funding, conclusions and recommendations regarding changed flow regimes below dams, the impact on fisheries, and methodologies used to assess flow requirements for 46 dams and diversions in California.

78-000543 Hazel, C. ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. PART B: CALIFORNIA. FINAL REPORT. U.S. Fish Wildl. Serv. FWS/OBS-76/33. xix + 48p. Dec. 1976. SFA 23(1)
[Jones and Stokes Assoc., Inc., 2321 P St., Sacramento, CA 98816] This report contains analysis, funding, conclusions and recommendations regarding changed flow regimes below dams, the impacts on fisheries, and methodologies used to assess flow requirements for 46 dams and diversions in California.

78-000544 Hazel, C.; Herrera, S.; Rectenwald, H.; Ives, J. ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. PART B: CALIFORNIA. CASE STUDIES. U.S. Fish Wildl. Serv. FWS/OBS-76/34. ix + 606p. Dec. 1976. SFA 23(1)
[Jones and Stokes Assoc., Inc., 2321 P St., Sacramento, CA 98816] This report contains individual analysis of changed flow regimes below dams, the impact on fisheries and methodologies used to assess flow requirements for 46 dams and diversions in California.

78-000545 Lamb, B. L. ,(ed.) GUIDELINES FOR PREPARING EXPERT TESTIMONY IN WATER MANAGEMENT DECISIONS RELATED TO INSTREAM FLOW ISSUES. U.S. Fish Wildl. Serv. FWS/OBS-77/19. 30p. July 1977. SFA 23(1)
[USFWS, Coop. Instream Flow Serv. Group, 333 W. Drake Rd., Fort Collins, CO 80521] The guidelines provide instructions and background information to biologists who believe their work may become part of a formal adjudication or administrative hearing. Topics covered include types of hearings, discovery procedures, rules of evidence, and samples of testimony.

78-000546 Nelson, W.; Hoban, F.; Colt, J.; Nelson, W.; Horak, G.; Hale, A.; Parkhurst, F.; Lewis, M. ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. PART A: ROCKY MOUNTAINS AND PACIFIC NORTHWEST. PACIFIC NORTHWEST REGION CASE STUDIES. U.S. Fish Wildl. Serv. FWS/OBS-76/31. ix + 398p. Dec. 1976. SFA 23(1)
[Enviro Control, Inc., 11300 Rockville Pike, Rockville, MD 20852] This report contains individual analysis of changed flow regimes below dams, the impact on fisheries and methodologies used to assess flow requirements for 47 dams and diversions in the Pacific Northwest Region.

78-000547 Nelson, W.; Horak, G.; Lewis, M.; Colt, J. ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. PART A: ROCKY MOUNTAINS AND PACIFIC NORTHWEST. FINAL REPORT. U.S. Fish Wildl. Serv. FWS/OBS-76/29. xiii + 120p. Dec. 1976. SFA 23(1)
[Enviro Control, Inc., 11300 Rockville Pike, Rockville, MD 20852] This report contains analysis, finding, conclusions and recommendations regarding changed flow regimes below dams, the impact on fisheries and metholologies used to assess flow requirements for 96 dams and diversions in the Rocky Mountain and Pacific Northwest Regions.

78-000548 Nelson, W.; Horak, G.; Lewis, M.; Colt, J. ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. PART. A: ROCKY MOUNTAINS AND PACIFIC NORTHWEST. EXECUTIVE SUMMARY. U.S. Fish Wildl. Serv. FWS/OBS-76/28. ix + 14p. Dec. 1976. SFA 23(1)
[Enviro Control, Inc., 11300 Rockville Pike, Rockville, MD 20852] This report contains the findings, conclusions and recommendations regarding changed flow regions below dams, the impact on fisheries and methodologies used to assess flow requirements for 96 dams and diversions in the Rocky Mountain and Pacific Northwest regions.

78-000549 Nelson, W.; Horak, G.; Hale, A.; Parkhurst, F.; Lewis, M.; Wagaman, D.; Hoban, E.; Colt, J. ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. PART A: ROCKY MOUNTAINS AND PACIFIC NORTHWEST. ROCKY MOUNTAIN REGION CASE STUDIES. U.S. Fish Wildl. Serv. FWS/OBS-76/30. ix + 373p. Dec. 1976. SFA 23(1)
[Enviro Control, Inc., 11300 Rockville Pike, Rockville, MD 20852] This report contains individual analysis of changed flow regimes below dams, the impact on fisheries and methodologies used to assess flow requirements for 49 dams and diversions in the Rocky Mountain Region.

78-000550 Ralston, S.; Hilbert, D.; Swift, D.; Carlson, B.; Menges, L. THE ECOLOGICAL EFFECTS OF COAL STRIP-MINING: A BIBLIOGRAPHY WITH ABSTRACTS. U.S. Fish Wildl. Serv. FWS/OBS-77/09. iv + 416p. Mar. 1977. SFA 23(1)
This bibliography contains references with abstracts, on the ecological effects of coal strip-mining in the western United States, with particularly emphasis on the Northern Great Plains. It does not represent an exhaustive search of all possible literature, but its broad scope will make it useful to workers engaged in stripmine rehabilitation. There are two parts to this bibliography; part I contains the references and abstracts, part II is an extensive "key word in Title" index to the references.

78-000551 Toetz, D. W. EFFECTS OF LAKE MIXING WITH AN AXIAL FLOW PUMP ON WATER CHEMISTRY AND PHYTOPLANKTON. Hydrobiologia 55 (2): 129-138. 18 Aug. 1977. SFA 23(1)
[Sch. Biol. Sci., Okla. State Univ., Stillwater 74074] This paper describes the effect of total lake mixing with an axial flow (Garton) pump on the limnology and phytoplankton of two Oklahoma lakes. The Garton pump destratified Ham's Lake (40 ha) in 3 days. Except for one small isolated basin, Ham's Lake Remained completely destratified for the rest of the summer. Algal biomass declined, numbers of species of green algae increased, but numbers of species of blue-green algae did not decrease as expected. After destratification, pH remained high (greater than 8), carbonate alkalinity was observed and reactive phosphate was undectable. An axial flow pump increased the heat content of Arbuckle Lake (951 ha) and caused the lake to destratify

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about one month earlier than usual. Increasing the heat content of the lake did not affect the concentration of most water quality parameters or the biomass of algae.

78-000552 Workman, D. AN EVALUATION OF STREAM IMPROVEMENTS ON PRICKLY PEAR CREEK. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 55: 275-283. July 1975. SFA 23(1)
[Mont. Dep. Fish Game, Livingston] Willow shoot plantings were made in May, 1968 to reestablish woody streamside vegetation which had been removed in the relocation of a portion of the Prickly Pear Creek channel during the construction of Interstate Highway 15. Sixty-one percent of the willows planted in double rows survived the first summer and twenty-six percent of those planted in single rows survived. In 1969, evaluation of the plantings indicated further losses resulting in poor success. In April, 1971, rock and soil berms were constructed at the toe of four steep eroding banks to stop streambank sloughing. The berms were used in shrub experiments to test the survival of naturally occurring species, when transplanted to reestablish streambank vegetation. The best results were obtained from spring-planted horizontal willows with 70.2 percent of the 74 planted surviving the first summer. Spring plantings of vertical willow and digwood had survival rates of 38.0 and 12.5 percent respectively. During the first summer, survival of summer transplants was not satisfactory. Common snowberry proved to be the most successful among the rooted stock transplanted to the back slopes adjacent to each berm. Blanket riprap was used to protect the highway grade from stream erosion. Willow (/Salix/ sp.) shoots were planted in the spaces between the large rocks at the water level to speed up the revegetation process. Natural seeding in areas where good soil quality existed accounted for reesatblishing dense vegetation on the berms and back slopes of the experimental areas. Fish population estimates in 1972 indicated that trout numbers returned to preconstruction (1967) levels with 79 rainbow trout and 90 brown trout per acre. The total pounds of trout (30 pounds per acre) was still below reconstruction levels (36 pounds per acre). Sucker populations remained at a level 59 percent below preconstruction numbers.--From abstr.

HARVEST, CREEL CENSUS

78-000553 Elsey, C. A.; Thomson, R. T. EXPLOITATION OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) IN LAC DES MILLE LACS, NORTHERN ONTARIO, BY COMMERCIAL AND SPORT FISHERIES, 1958-75. J. Fish. Res. Board Can. 34 (10): 1769-1773. Oct. 1977. In English with French summ. SFA 23(1)
[Ontario Minist. Nat. Resour., Thunder Bay, ON P7C 5G6, Canada]

78-000554 Owers, J. E. INCOME ESTIMATES AND REASONABLE RETURNS IN ALASKA'S SALMON FISHERIES. NOAA Fish. Bull. 75 (3): 483-492. July 1977. SFA 23(1)
[Cornell Law Sch., Myron Taylor Hall, Ithaca, NY 14853] Earnings in some fisheries may fall to a level that is unacceptable from the viewpoint of public policy. Using the Alaska salmon fisheries as an example, this paper examines a method for establishing the number of operating units that will provide a reasonable economic return in a fishery. Estimates are provided of the rates of return that can be expected with various numbers of operating units. Three criteria are then developed to determine a reasonable rate of return. These criteria include: 1) a comparison with wages in a similar industry in

78-000554 CONTINUED
an equal time period, 2) a comparison with total annual incomes from all sources with total incomes of workers in other occupations, and 3) an estimate provided by fishermen themselves. These three different measures indicate an optimum number of operating units within a fairly narrow range. In some fisheries it appears that substantial reductions in the number of fishing units will not be sufficient to raise incomes to an "acceptable" level. This raises questions about the allocation of valuable fishery resources among various user groups.

78-000555 Stone, M. D. FISHING LICENSE FOLLOW-UP. Wyo. Wildl. 41 (11): 10-11. Nov. 1977. SFA 23(1)
[Wyo. Game Fish Dep., Cheyenne 82002]

REGULATIONS

78-000556 Pettit, S. W. COMPARATIVE REPRODUCTIVE SUCCESS OF CAUGHT-AND-RELEASED AND UNPLAYED HATCHERY FEMALE STEELHEAD TROUT (/SALMO GAIRDNERI/) FROM THE CLEARWATER RIVER, IDAHO. Trans. Am. Fish. Soc. 106 (5): 431-435. Sept. 1977. SFA 23(1)
[Idaho Dep. Fish Game, 1540 Warner Ave., Lewiston 83501]

78-000557 Skud, B. E. REGULATIONS OF THE PACIFIC HALIBUT FISHERY, 1924-1976. Int. Pac. Halibut Comm. Tech. Rep. No. 15. 47p. 1977. SFA 23(1)
[Int. Pac. Halibut Comm., P.O. Box 5009, University Station, Seattle, WA 98105] Conservation measures for the Pacific halibut fishery originally were incorporated in the Canadian-United States Convention of 1923. This Convention, that established the Halibut Commission, included only two regulatory controls, one for a closed season in the winter, the other pertaining to incidentally-caught halibut. The Convention of 1930 and subsequent revisions in 1937 and 1953 gave the Commission broader authority and specified other types of regulatory measures that could be used in the management of the fishery. Under these directives, regulations for the fishery were first published as a separate document in 1932. When broader authority was granted and the necessity for improving the statistical data base became apparent, the regulatory measures increased in number and complexity. The description of the licensing system, statistical reporting, and regulations concerning the incidental catch of halibut such as the "permit fishery" were particularly involved and accounted for nearly one-fourth of the text in the regulation document. After 1970, the language was simplified and specific restrictions were eliminated. The regulations during the past five decades reflect the changes in the condition of the resource, the fishery, and its enforcement, as well as changes in the Convention and its interpretations. The chronology of the different regulatory measures and their rationale are reviewed in this report.

FISH CONTROL AND REMOVAL

78-000558 Johnson, F. H. RESPONSES OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) AND YELLOW PERCH (/PERCA FLAVESCENS/) POPULATIONS TO REMOVAL OF WHITE SUCKER (/CATOSTOMUS COMMERSONI/) FROM A MINNESOTA LAKE, 1966. J. Fish. Res. Board Can. 34 (10): 1633-1642. Oct. 1977. In English with French summ. SFA 23(1)
[T. C. Osborn: Minn. Dep. Nat. Resour., Div. Fish Wildl., St. Paul 55155]

MARKING AND TAGGING

78-000559 Facey, D. E.; McCleave, J. D.; Doyon, G. E. RESPONSES OF ATLANTIC SALMON PARR TO OUTPUT OF PULSED ULTRASONIC TRANSMITTERS. Trans. Am. Fish. Soc. 106 (5): 489-498. Sept. 1977. SFA 23(1)
[Dep. Zool., Univ. Vt., Burlington 05401]

78-000560 International Atomic Energy Agency DESIGN OF RADIOTRACER EXPERIMENTS IN MARINE BIOLOGICAL SYSTEMS. Int. At. Energy Agency Tech. Rep Ser. No. 167. 289p. 1975. SFA 23(1)
[International Atomic Energy Agency, Vienna, Austria]

78-000561 Romberg, G. P.; Prepejchal, W.; Spigarelli, S. A. TEMPERATURE EXPOSURE MEASURED BY THE USE OF THERMOLUMINESCENCE. Science 197 (4311): 1364-1365. 30 Sept. 1977. SFA 23(1)
[Ecol. Sci. Sect., Radiol. Environ. Res. Div., Argonne Natl. Lab., Argonne, IL 60439] A method has been developed to measure temperature exposure based on the use of the temperature-dependent property of thermoluminescence fade. This property provides a relatively simple and inexpensive method for measuring both average and accumulated temperature exposure without the need for sophisticated temperature-recording equipment.

STOCKING AND INTRODUCTIONS

78-000562 Carlander, K. D.; Payne, P. M. YEAR-CLASS ABUNDANCE, POPULATION, AND PRODUCTION OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) IN CLEAR LAKE, IOWA, 1948-74, WITH VARIED FRY STOCKING RATES. J. Fish. Res. Board Can. 34 (10): 1792-1799. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Anim. Ecol., Iowa State Univ., Ames]

78-000563 Gasaway, R. D.; Drda, T. F. EFFECTS OF GRASS CARP INTRODUCTION ON WATERFOWL HABITAT. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 73-85. 1977. SFA 23(1)
[Fla. Game Fresh Water Fish Comm., Lake Wales]

78-000564 Maloney, J.; Schupp, D. USE OF WINTER-RESCUE NORTHERN PIKE IN MAINTENANCE STOCKING. Minn. Dep. Nat. Resour. Sect. Fish. Invest. Rep. No. 345. 29p. July 1977. SFA 23(1)
[Minn. Dep. Nat. Resour., St. Paul 55155] The stocking of 0-Age northern pike taken in winter rescue operations in central Minnesota resulted in high returns of stocked fish to anglers, but the relative contribution to the sport fishery was high only in Horseshoe Lake where the abundance of resident pike was low. Guidelines for stocking winter rescue young-of-year and yearling northern pike are presented.--From abstr.

78-000565 Purych, P. R. POOR RETURNS OF HATCHERY-REARED LAKE TROUT TO THE SPORT FISHERY OF FLACK LAKE, CNTARIO, 1968-74. Prog. Fish-Cult. 39 (4): 185-186. Oct. 1977. SFA 23(1)
[Ontario Minist. Nat. Resour., Blind River, ON P0R 1B0, Canada]

78-000566 Schweigert, J. F.; Ward, F. J.; Clayton, J. W. EFFECTS OF FRY AND FINGERLING INTRODUCTIONS ON WALLEYE (/STIZOSTEDION VITREUM VITREUM/) PRODUCTION IN WEST BLUE LAKE, MANITOBA. J. Fish. Res. Board Can. 34 (11): 2142-2150. Nov. 1977. In English with French summ. SFA 23(1)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

78-000567 Weithman, A. S.; Anderson, R. O. SURVIVAL, GROWTH, AND PREY OF ESOCIDAE IN EXPERIMENTAL SYSTEMS. Trans. Am. Fish. Soc. 106 (5): 424-430. Sept. 1977. SFA 23(1)
[Mo. Coop. Fish. Res. Unit, Univ. Mo., Columbia 65201]

FISHING GEAR AND TECHNIQUES

78-000568 Coles, T. F.; Swinney, G. N.; Jones, J. W. A TECHNIQUE FOR DETERMINING THE DISTRIBUTION OF PELAGIC FISH LARVAE. J. Fish Biol. 11 (2): 151-159. Aug. 1977. SFA 23(1)
[Freshwater Fish. Unit, Life Sci. Bldg., Liverpool Univ., Crown St., Liverpool L69 3BX, England] A technique is described for studying small scale distributional patterns of fish larvae in the pelagic region. A plankton net is mounted beneath the bows of a small boat, the contents of the net are emptied continually by a suction pump. This system has advantages over previous techniques as it allows a large number of small discrete samples to be taken over a wide area in a short space of time. Preliminary results showed the population of perch larvae in Llyn Tiged is extremely clumped and the overall abundance of the larvae decreases as samples are taken progressively further away from the south-west end of the lake.

78-000569 Cooper, J. E. DURABLE ICHTHYOPLANKTON SAMPLER FOR SMALL BOATS. Prog. Fish-Cult. 39 (4): 170-171. Oct. 1977. SFA 23(1)
[Appalachian Environ. Lab., Univ. Md., Frostburg 21532]

78-000570 Herke, W. H.; Yakupzack, P. M.; Perry, W. G. A TRAP FOR USE ON TIDAL WEIRS AND STREAMS. Northeast Gulf Sci. 1 (1): 34-38. June 1977. SFA 23(1)
[La. Coop. Fish. Res. Unit, La. State Univ., Baton Rouge 70803] Over 100,000 ha of Louisiana coastal marsh have been semi-impounded by weir construction. This paper describes a trap designed specifically for use at weirs to study certain aspects of the juvenile life history of aquatic species. The trap could be modified easily for use in other situations.

78-000571 Kitahara, T.; Irie, T.; Hayakawa, K. [ON THE CATCH EFFICIENCY OF GILLNET TO /AGRAMMUS AGRAMMUS/.] Bull. Jpn. Soc. Sci. Fish. 43 (9): 1035-1041. Sept. 1977. In Japanese with English summ. SFA 23(1)
[Dep. Fish., Kyoto Univ., Kyoto, Japan] An attempt was made to determine the catch efficiency of gillnet to /Agrammus agrammus/ from the data on catch in the fishing experiment of gillnet, which was carried out in a sargassum bed of Maizuru Bay. Analyses of the data on catch gave 0.23-0.27 and 0.090 as the estimates of the catch efficiency of three nets to unmarked and marked fish in the daytime operation of one day, respectively. Here, the catch efficiency was defined as the probability that, in the exploitable area where the species had a chance of being trammeled by the nets, the species was trammeled by the nets in a certain duration of the operation. There was the time zone in which the species were frequently trammeled by the nets and it seemed that it corresponded to that of their active feeding. In addition, it was supposed that the exploitable area of a net was considerably small.

78-000572 Kolbing, A. UEBER DE EINFLUSS ERHOEHTER NETZMASCHENWEITEN IN DER COREGONENFISCHEREI. [THE EFFECT OF ENLARGED MESHSIZES IN COREGONID FISHERIES.] Arch. Hydrobiol. 80 (2): 239-247. Aug. 1977. In German with English summ. SFA 23(1)
[Bayerische Landesanstalt fur Fischerei, Weilheimer Strasse 8a, 8130 Stranberg, West Germany] Owing to the effect of eutrophication, the mesh size of gillnets in coregonid fisheries of the Starnberger See was enlarged from 40 mm to 44 mm. The result was considerable improvement of the age-group structures. The age group I + has disappeared from the catches. In general fishermen's catches consist of fish in the age-group III +. The average weight of a fish has increased from 285 g to 400 g. If a fisherman catches 1000 fish in 1975, he therefore has a weight of 115 kg more than he would have had in 1971.

78-000573 Yesaki, M. INNOVATIONS IN HARVEST OF PELAGIC RESOURCES. Mar. Fish. Rev. 39 (9): 14-23. Sept. 1977. SFA 23(1)
[Reg. Fish. Surv. Dev. Proj., P.O. Box 3225, Doha, Qatar]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

78-000574 Matthews, G. M.; Swan, G. A.; Smith, J. R. IMPROVED BYPASS AND COLLECTION SYSTEM FOR PROTECTION OF JUVENILE SALMON AND STEELHEAD TROUT AT LOWER GRANITE DAM. Mar. Fish. Rev. 39 (7): 10-14. July 1977. SFA 23(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] A new improved system for diverting, bypassing, and collecting juvenile salmon, /Oncorhynchus/ sp., and steelhead trout, /Salmo gairdneri/, at Lower

78-000574 CONTINUED
Granite Dam on the lower Snake River is described. Major changes from previous systems of this type include a special fish screen slot for placement of the improved traveling screen, an open gallery bypass system for routing fish around the turbines, and a collection and holding area totally supplied by gravity-flow. The system is currently being evalnated by the national Marine Fisheries Service under contract to the U.S. Army Corps of Engineers.

78-000575 Serchuk, F. M. THE EFFECTS OF THE LUDINGTON PUMPED STORAGE POWER PROJECT ON FISH PASSAGE THROUGH PUMP-TURBINES AND ON FISH BEHAVIORAL PATTERNS: PART I. AN EVALUATION OF MORTALITY INCURRED BY FISH PASSING THROUGH PUMP-TURBINES AT THE LUDINGTON PUMPED STORAGE POWER PLANT. PART II. MOVEMENT PATTERNS AND ORIENTATION OF FISHES IN THE LUDINGTON PUMPED STORAGE RESERVOIR AS REVEALED BY TRACKING STUDIES. Ph.D. dissertation, Mich. State Univ. 144p. 1976. From Diss. Abstr. Int. B Sci. Eng. 37(9), 1977. SFA 23(1)
Methods were developed for introducing fish tc the turbines using weighted paper sacks and for recapturing individuals using jaw-fastened styrofoam floats. The passage of various sized wooden boards was also studied to provide additional infcrmation on object size and mechanical damage. Twenty fish tests were conducted in 1974 and 1975 using rainbow trout, chinook and coho salmon, and yellow perch. Pumping mode mortality estimates were derived from five tests in 1974 and six tests in 1975. Mortalities in 1974 varied from 33-63 percent and averaged 56.5 percent ± 13.3 percent. During 1975, adjusted mortalities ranged fro 54-75 percent and averaged 67.7 percent ± 7.2 percent. Damage rates for fish killed during pumping passage were 37.2 percent in 1974 and 61.5 percent in 1975. Most injured fish displayed lacerations or decapitation implying that mechanical contact and shearing forces were causative agents. Size-selective mortality could not be unquestionably established in pumping experiments. Estimates of generating mortality were obtained from one experiment in 1974 and four experiments in 1975. Mortality was 67.2 percent in 1974 and averaged 40.7 ± 27.1 percent in 1975. Adjusted experimental estimates varied from 35-75 percent in 1975. About half (47.8 percent) of the fish killed during generation were damaged. Nearly all of the injuries were lacerations or decapitations. Evidence for size-selective mortality in generating trials was absent. Movement patterns, activity levels, and residnece periods of carp and trout were studied during 1974 and 1975. Most fish movements were restricted to areas adjacent to the reservoir embankment. Both carp and trout exhibited a crepscular rhythm in swimming speed. The need for future studies related to the impact of hydroelectric development on fish behavior and population dynamics is indicated.--From abstr.

MATHEMATICS, STATISTICAL METHODS AND MODELING

78-000576 Clark, R. D., Jr.; Garling, D. L., Jr.; Lackey, R. T. COMPUTER USE IN FRESHWATER FISHERIES MANAGEMENT. Fisheries (Bull. Am. Fish. Soc.) 2 (4): 21-23. July-Aug. 1977. SFA 23(1)
[Mich. Dep. Nat. Resour., Ann Arbor] A brief questionnaire was sent to chiefs of the 50 freshwater fisheries management agencies in the United States to determine how they currently use computers and how they plan to use or perceive the need to use computers in the near future. Currently, the leading use of computers is in automated mail or creel surveys, followed by biostatistical calculations and data storage and retrieval. Eight fisheries agencies reported using computerized resource allocation or ecosystem models, while three agencies reported not using computers for any reason. Two agencies

78-000576 CONTINUED
predicted their computer needs over the next 5 years would remain about the same as the present, 40 agencies predicted their needs would probably increase, and five states planned great expansions of their use of computers.

78-000577 DeAngelis, D. L.; Christensen, S. W.; Clark, A. G. RESPONSES OF A FISH POPULATION MODEL TO YOUNG-OF-THE-YEAR MORTALITY. J. Fish. Res. Board Can. 34 (11): 2124-2132. Nov. 1977. In English with French summ. SFA 23(1)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

78-000578 Hesse, L. FIRE 1. A COMPUTER PROGRAM FOR THE COMPUTATION OF FISHERY STATISTICS ON SAMPLES WITH AGED AND NON-AGED SUBSAMPLES IBM 360/65, FORTRAN IV G LEVEL. Nebr. Game Parks Comm. Tech. Ser. No. 1. 60p. 1977. SFA 23(1)
[Nebr. Game Parks Comm., P.O. Box 30370, Lincoln 68503]

78-000579 Leidy, G. R.; Jenkins, R. M. THE DEVELOPMENT OF FISHERY COMPARTMENTS AND POPULATION RATE COEFFICIENTS FOR USE IN RESERVOIR ECOSYSTEM MODELING. U.S. Army Corps Eng. Contract Rep. No. Y-77-1. 134p. June 1977. SFA 23(1)
[U.S. FWS, Natl. Reservoir Res. Prog., Fayetteville, AR 72701]

78-000580 Rafail, S. Z. A SIMPLIFICATION FOR THE STUDY OF FISH POPULATIONS BY CAPTURE DATA. NOAA Fish. Bull. 75 (3): 561-569. July 1977. SFA 23(1)
[Coll. Sci. Technol., P.M.B. 5080, Port Harcourt, Nigeria]
Expressions given by Rafail for estimating catchability are modified here to eliminate iteration, for better accuracy, and a large economy in calculations and time. The evaluation of catchability allows the estimatation of other important parameters with the useful assumption of their variabilities according to seasons and recognized sections of a population.

78-000581 Strogonov, A. A. STATISTICAL EVALUATION OF ACCURACY IN THE DETERMINATION OF AGGREGATION DENSITY AMONG COMMERCIAL FISHES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 664-667. 1976. SFA 23(1)
[Admin. Prospecting Res. Fleet South. Basin, Sevastopol, USSR]

LAKE MANAGEMENT & RESEARCH

78-000582 Klessig, L. L. CASE HISTORY: TEN YEARS OF EDUCATION ON LAKE MANAGEMENT. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 313-322. 1977. SFA 23(1)
[Univ. Wis.-Extension, Madison]

78-000583 Lawrence, W. M. EASTLAND FISHERIES SURVEY OF THE GREAT LAKES. Atl. States Mar. Fish. Comm. Spec. Rep. No. 1. v + 21p. Oct. 1976. Available from Atl. States Mar. Fish. Comm., 1717 Massachusetts Ave., NW, Washington, DC 20036. SFA 23(1)

78-000584 Rosner, M. H. IMPACT UPON LOCAL PROPERTY TAXES OF ACQUISITIONS WITHIN THE ST. CROIX RIVER STATE FOREST IN BURNETT AND POLK COUNTIES. Wis. Dep. Nat. Resour. Tech. Bull. No. 101. 24p. 1977. SFA 23(1)
[Wis. Dep. Nat. Resour., Box 7921, Madison 53703]

78-000585 Siddiqui, A. Q. LAKE NAIVASHA (KENYA, EAST AFRICA) FISHERY AND ITS MANAGEMENT TOGETHER WITH A NOTE ON THE FOOD HABITS OF FISHES. Biol. Conserv. 12 (3): 217-228. Nov. 1977. SFA 23(1)
[Dep. Zool., Kenyatta Univ. Coll., P.O. Box 43844, Nairobi, Kenya] The Lake Naivasha fishery is constituted by three introduced species, /Sarotherodon leucosticus/, /Tilapia zillii/ and /Micropterus salmoides/. No indigenous species are now found in the lake. /S. spilurus niger/, another introduced species, and hybirds of /S. s. niger/ X /S. leucostictus/, abundant in 1961, have almost completely disappeared. The annual catch of /Sarotherodon/-/Tilapia/ and /M. salmoides/ between 1968 and 1974 ranged from 109.2 to 1479.6 metric tons and 7.9 to 471.9 metric tons respectively. /S. leucostictus/ is a bottom feeder (chironomid larvae 64.24 percent, detritus 20.58 percent), /T. zillii/ feeds on aquatic macrophytes (76.62 percent) and /M. salmoides/ feeds almost exclusevely on crayfish (78.25 percent). A major portion of the fish food present in the lake is left unused. The yield, which has progressively declined since 1968, could be increased considerably by introducing certain management measures. These are discussed.

RIVER AND STREAM MANAGEMENT & RESEARCH

78-000586 Boaze, J. L. AN EVALUATION OF THE SOUTH PLATTE RIVER FISH POPULATION BETWEEN DECKERS AND SOUTH PLATTE, COLORADO. U.S. Fish Wildl. Serv., Salt Lake City, Utah 30p. 1977. SFA 23(1)
[U.S. Fish Wildl. Serv., Salt Lake City, Utah] A 31.4 km reach of the South Platte River was sampled for two years. Mean population estimates indicate 1819 fish/ha, of which 1554 were brown (/Salmo trutta/) and rainbow (/Salmo gairdneri/) trout. Mean standing crop of harvestable size (≥20.3 cm) trout was 803 trout/ha. Population estimates for white (/Catostomus commersoni/) and longnose (/Catostomus catostomus/) suckers were 138 and 126 fish per ha respectively. Coefficient of condition for trout ≥20.3 cm indicates a population in excellent condition.

78-000587 Bovee, K. ASSESSMENT AND IMPLEMENTATION OF "IN-STREAM VALUE STUDIES" FOR THE NORTHERN GREAT PLAINS. Proc. Fort Union Coal Field Symp. Vol 2. 112-123. Apr. 1975. SFA 23(1)
[Univ. Mont., Bozeman]

78-000588 Cooper, A. C. EVALUATION OF THE PRODUCTION OF SOCKEYE AND PINK SALMON AT SPAWNING AND INCUBATION CHANNELS IN THE FRASER RIVER SYSTEM. Int. Pac. Salmon Fish. Comm. Prog. Rep. No. 36, 80p. 1977. SFA 23(1)
[Int. Pac. Salmon Fish Comm., New Westminster, BC, Canada] A description is presented of each of the five spawning channels and one incubation channel operated by the Commission. Details of survival from eggs deposited to returning adults are presented, together with the costs and benefits. The six channels were built over the period 1960-1974 at a cost of $1,682,000. Five of them, costing $921,000, have produced sockeye and pink salmon with a landed value of $10,000,000 in this period. As utilization of these channels increases to optimum levels, it is expected that the average annual landings will be doubled. The construction of additional similar facilities as recommended by the commission is considered fully justified.

78-000589 Elser, A. A. FISH DISTRIBUTION AND DIVERSITY OF A MONTANA PRAIRIE STREAM. Proc. Fort Union Coal Field Symp. Vol. 2. 124-137. Apr. 1975. SFA 23(1)
[Mont. Dep. Fish Game, Miles City 59301]

78-000590 Kmiotek, S. BUY A TROUT STAMP. TWO-FIFTY TO SAVE A STREAM. Wis. Nat. Resour. 1 (6): 28-29. Nov.-Dec. 1977. SFA 23(1)
[Wis. Dep. Nat. Resour., Madison]

78-000591 Livingston, R. J.; Joyce, E. A., Jr. , (eds.) PROCEEDINGS OF THE CONFERENCE ON THE APALACHICOLA DRAINAGE SYSTEM, 23-24 APRIL 1976, GAINESVILLE, FLORIDA. Fla. Mar. Res. Publ. No. 26. 177p. Apr. 1977. SFA 23(1)
[Fla. Dep. Nat. Resour., Mar. Res. Lab., 100 Eighth Ave. SE, St. Petersburg 33701] The Proceedings provide a compendium of information concerning the intrinsic and extrinsic values of the Apalachicola Drainage System. Various topics are covered including the legal, economic, managerial, and environmental aspects of the Apalachicola basin with contributions from two state university systems, three departments of state government, the Florida Bar, one private Florida research facility, and one out-of-state university system. Papers are presented on the geobotany, terrestrial and aquatic fauna, and natural history of the Apalachicola River and Bay systems. The Apalachicola Valley is shown to be a center of endemism in the Southeastern United States and critical to the environmental and economic considerations of a three-state area (Florida, Georgia, Alabama). The principal aim of the conference was to present a multidisciplinary base of information that can be used in future planning and management decisions.

78-000592 Miller, M.; Hartman, B.; Dunford, D. FISH AND WILDLIFE VALUES OF THE APALACHICOLA RIVER AND FLOODPLAIN. Fla. Mar. Res. Publ. No. 26. p. 122-129. Apr. 1977. SFA 23(1)
[Fla. Game Fresh Water Fish. Comm., Tallahassee 32304]

78-000593 Orsborn, J. F.; Allman, C. H. , (eds.) PROCEEDINGS OF THE SYMPOSIUM AND SPECIALTY CONFERENCE ON INSTREAM FLOW NEEDS (2 VOL.). Am. Fish. Soc., Bethesda, Md. 551p. (Vol. 1); 657p. (Vol. 2). Sept. 1976. SFA 23(1)
[Am. Fish. Soc., 5410 Grosvenor Lane, Bethesda, MD 20014] A collection of papers on social, Legal, and biological aspects of stream flows as they relate to fish and wildlife.--rs

78-000594 Saiki, M. K. AN ECOLOGICAL EVALUATION OF GAME FISHES AT DEER ISLAND LAKE, LOWER COLORADO RIVER. Ph.D. dissertation, Univ. Ariz. 261p. 1976. From Diss. Abstr. Int. B Sci. Eng. 37(9), 1977. SFA 23(1)
Large reservoirs and channelization have completely changed the aquatic environment of the Lower Colorado River. The major habitats of the New environment consist of reservoirs, backwaters, and inter-reservoir river segments. These major habitats interact, with the river segments being particularly important to the fisheries within backwaters. Field data were collected from Deer Island Lake between October 1973 and August 1975. This warm holomictic backwater is joined to the river by a culvert. Surface area of the backwater is 40.7 ha and maximum depth is 3.0 m. Water quality analysis indicated that the backwater was poorly flushed by the river. Conditions were frequently suboptimal for good fish production. Fishes were represented by 13 species, all exotic to the Lower Colorado River. The most abundant fishes were largemouth bass, bluegill, redear sunfish, threadfin shad, channel catfish and carp. Channel catfish and rainbow trout are stocked annually since spawning does not occur. Other fishes are maintained through natural reproduction. The following recommendations were offered to improve the fishery at Deer Island Lake: (1) increase the flushing rate of the backwater and (2) remove the gratings from the culvert. By increasing the flushing rate, water quality for fish life should improve. Removal of culvert gratings would allow migration, and reduce over-crowding among the larger fishes.--From abstr.

78-000595 Wiley, R. WESTERN WYOMING WATER DEVELOPMENT. Wyo. Wildl. 41 (11): 28-30. Nov. 1977. SFA 23(1)
[Wyo. Game Fish Dep., Laramie]

78-000596 Zalumi, S. G. ON THE CAUSES OF VARIABLE FISH PRODUCTIVITY IN THE LOWER REACHES OF THE DNIEPER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (4): 659-663. 1976. SFA 23(1)
[Kherson Dep., Ukrainian Fish. Res. Inst., USSR] In the lower reaches of the Dnieper as in the lower reaches of other regulated rivers, the main factor determining the strength of year-classes of young semidiadromous fishes is the height of the spring flood and the size of the spawning and rearing area determined by it. Temperature conditions during the period of reproduction influence, the strength of year-classes. Sharp fluctuations in air and water temperature cause the degeneration of eggs in bream spawners and have a negative influence on the survival of progeny. The viability and strength of fish year-classes also depend on the nutritional level of parents in the preceding year. Poorer quality sexual products due to poor feeding conditions for parents are more strongly manifested in an unfavorable reproductive situation (absence of typical spawning grounds with low flood waters, temperature fluctuations).--Concl.

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT

78-000597 Ayles, G. B.; Barica, J. AN EMPERICAL METHOD FOR PREDICTING TROUT SURVIVAL IN CANADIAN PRAIRIE LAKES. Aquaculture 12 (2): 181-185. Oct. 1977. SFA 23(1)
[Fish. Mar. Serv., Freshwater Inst., Winnipeg, MB R3T 2N6, Canada] An empirical method is presented for determining the probability of exceeding a given survival of rainbow trout in eutrophic Canadian prairie lakes used for extensive aquaculture. Significant mortalities caused by oxygen deficiency following the collapse of large blooms of blue-green algae occur in about a quarter of the lakes. The method uses the measurement of maximum ammonia at midwinter before stocking to predict the probability of algal collapse in the following summer. This is then used in conjunction with the relative cumulative frequency of survival of fish from the two types of lakes (those with and without an algal collapse) to calculate the probability of exceeding a given survival of fish.

LARGE IMPOUNDMENT MANAGEMENT & RESEARCH

78-000598 Mayhew, J. THE EFFECTS OF FLOOD MANAGEMENT REGIMES ON LARVAL FISH AND FISH FOOD ORGANISMS AT LAKE RATHBUN. Iowa Cons. Comm. Fish. Res. Tech. Ser. No. 77-2. v + 46p. June 1977. SFA 23(1)
[Iowa Conserv. Comm., Des Moines]

78-000599 Momot, W. T.; Erickson, J.; Stevenson, F. MAINTENANCE OF A WALLEYE, /STIZOSTEDION VITREUM VITREUM/, FISHERY IN A EUTROPHIC RESERVOIR. J. Fish. Res. Board Can. 34 (10): 1725-1733. Oct. 1977. In English with French summ. SFA 23(1)
[Dep. Biol., Lakehead Univ., Thunder Bay, ON P7B 5E1, Canada]

78-000600 Paragamian, V. L. FISH POPULATION DEVELOPMENT IN TWO IOWA FLOOD CONTROL RESERVOIRS AND THE IMPACT OF FISH STOCKING AND FLOODWATER MANAGEMENT. Iowa Cons. Comm. Fish. Res. Tech. Ser. No. 77-1. v + 59p. June 1977. SFA 23(1)
[Iowa Conserv. Comm., Des Moines] Fish populations in Lakes Red Rock and Rathbun were studied after impoundment. Lake Red Rock is characterized by extreme variations in water levels while Lake Rathbun is relatively stable. Fish species suited to river type habitat developed more extensively at Lake Red Rock than at Lake Rathbun. River carpsucker, carp, bullhead, and crappie dominated the fishery at Lake Red Rock while crappie and carp were the most important fish species inhabiting Lake Rathbun. Analysis of variance testing showed no significant change in the species composition in either reservoir; however, catch success within species varied and was dependent on year class success and stockings. Walleye, northern pike, largemouth bass, white bass, channel catfish, and muskellunge were stocked at varying rates, sizes and intervals at one or both reservoirs. Strong year classes of bluegill, crappie, and largemouth bass were recorded at Lake Rathbun in 1973, a year of high reservoir elevation, as were bass and bullhead at Lake Red Rock. High water at Lake Red Rock in 1974 was beneficial to white bass, crappie and bigmouth buffalo. Fish stocking was important in establishment and maintenance of many fish species. Suggested stocking rates are: 2,500 larval walleye/ha (1,000/ac), 2,500 larval northern pike/ha (1,000/ac), and 250 postlarval largemouth bass/ha (100/ac). Further consideration should be given to stocking at

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periods of high zooplankton populations and releases of fish of a larger size to insure higher survival. In general, growth of most species was best during the first few years of impoundment, in later years growth was influenced by storage volume and water quality. Recommendations for reservoir management were presented and included shoreline stabilization, stocking guidelines, habitat improvement, commercial fishing, increased conservation pool elevation and fish population assessment.--From abstr.

78-000601 Sparrowe, R. D. HARRY S. TRUMAN DAM AND RESERVOIR--A CASE HISTORY OF PROBLEMS IN FISH AND WILDLIFE COORDINATION. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 42-55. 1977. SFA 23(1)
[U.S. FWS, Washington, DC]

78-000602 Walburg, C. H. LAKE FRANCIS CASE, A MISSOURI RIVER RESERVOIR: CHANGES IN THE FISH POPULATION IN 1954-75, AND SUGGESTIONS FOR MANAGEMENT. U.S. Fish Wildl. Serv. Tech. Pap. 95. 12p. 1977. SFA 23(1)
[U.S. FWS, North Cent. Reservoir Invest., Yankton, SD 57078]
Studies conducted during the first 23 years of impoundment of Lake Francis Case indicated that fish abundance in the early 1970's was about half that in the late 1950's. Of 39 species collected, 12 were abundant in the 1950's and 8 in the 1970's, but only 4 were abundant throughout the impoundment period. Changes in fish abundance and species composition were mainly a result of poor reproductive success caused by water-level fluctuations during the spring and early summer, and physical changes in the shoreline environment. Fish reproduction was most successful in years when the reservoir was filled in the spring and a nearly constant level was maintained through July. Survival and growth would probably improve if the pool drawdown in the fall were reduced. Fish abundance could be increased if water-level management conformed more closely to requirements for fish reproduction. This is only possible in some years, however, because of the multipurpose function of the reservoir. In consideration of this restraint, I recommend a 3-year cycle in pool level management: maintenance of a relatively low level for two consecutive years, to encourage the growth of shoreline vegetation, and a high level during the 3rd year, through July. This flooding of the vegetation should significantly increase the likelihood of successful spawning and survival of the young of a number of important game species, as well as increase the abundance of food (forage fishes and invertebrates). If future water management is similar to that of the early 1970's the fish population is expected to continue to be dominated by seven species: Goldeye (/Hiodon alosoides/), emerald shiner (/Notropis atherinoides/), river carpsucker (/Carpiodes carpio/), channel catfish (/Ictalurus punctatus/), yellow perch (/Perca flavescens/), white bass (/Morone chrysops/), and walleye (/Stizostedion vitreum vitreum/).

ESTUARY MANAGEMENT & RESEARCH

78-000603 Herke, W. H. LIFE HISTORY CONCEPTS OF MOTILE ESTUARINE-DEPENDENT SPECIES SHOULD BE RE-EVALUATED. W. H. Herke, Baton Rouge, LA 101p. 1977. Available at $7.50 from the author at 555 Starry Lane, Baton Rouge, LA 70808. SFA 23(1)
Much of the life history of estuarine-dependent fishes and crustaceans along the U. S. Atlantic and Gulf coasts has been inferred through a direct interpretation of their juvenile length frequency distributions in periodic samples taken from open-water bay and

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nearshore areas. Thus the organisms taken may have been mostly transients between the sea and nursery areas farther inshore, rather than members of the same "population" throughout the sampling. Direct interpretations also assume negligible effects over the sampling time span from such variables as recruitment, emigration, changing susceptibility to capture as the organism grows, and size selective fishing mortality. Actually, these effects may be very substantial. This paper discusses these variables, as well as the probable fact that organisms respond, by emigration, to seemingly minor changes in environmental factors. A method is given for considering the effects of such variables, and the organism's response to environmental changes, when performing length frequency analysis. Also given is a detailed example of the use of the method on Atlantic croaker samples taken in a marsh nursery. The example leads to numerous conclusions which contradict current beliefs. These conclusions include, but are not limited to, the following; (1) juveniles reponded, by emigration, to minor variations in environmental factors; (2) emigration was primarily a "bleeding off" of larger juveniles from the nursery; (3) recruitment periods into the marsh sometimes differ considerably from open-water estimates; and (4) growth rates have been drastically underestimated in the past, with a consequent overestimate of initial spawning age. The overall conclusion is that most previous life history concepts with are based on juvenile length frequency analysis are open to serious doubt and should be subjected to critical re-evaluation and testing using other methods.

78-000604 Lindall, W. N., Jr.; Saloman, C. H. ALTERATION AND DESTRUCTION OF ESTUARIES AFFECTING FISHERY RESOURCES OF THE GULF OF MEXICO. Mar. Fish. Rev. 39 (4): 1-7. Sept. 1977. SFA 23(1)
NMFS, 9450 Gandy Blvd., St. Petersburg, FL 33702] Both the commercial and recreational fishing industries of the Gulf of Mexico are overwhelmingly dependent on estuaries. About 90 percent of the commercial catch and 70 percent of the recreational catch are made up of species that are estuarine dependent. Man's alteration of estuaries is threatening these fishery resources. Data from recently published inventories of major natural and man-made estuarine features of the five gulf coastal states indicated that the total gulf estuarine area is 13,965,910 acres, including 7,890,611 acres of open-water area and 6,075,299 acres of emergent tidal vegetation. Submerged grass beds total 796,796 acres and live oyster beds amount to 158,663 acres. Major man-made alterations include 4,446 miles of federally maintained navigation channels, 138,458 acres of fill, and 795,609 acres closed to shell fishing because of pollution.

78-000605 Wallace, D. H. NEW DIMENSIONS IN THE MANAGEMENT OF COASTAL FISHERIES AND WILDLIFE. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 25-29. 1977. SFA 23(1)
[NOAA, Washington, DC]

MARINE MANAGEMENT & RESEARCH

78-000606 Atlantic States Marine Fisheries Commission EASTLAND FISHERIES SURVEY OF THE ATLANTIC COAST REGION. Atl. States Mar. Fish. Comm. Spec. Rep. No. 2. v + 73p. June 1977. SFA 23(1)
[1717 Massachusetts Ave., NW, Washington, DC 20036]

78-000607 Foerster, J. W.; Reagan, S. P. MANAGEMENT OF THE NORTHERN CHESAPEAKE BAY AMERICAN SHAD FISHERY. Biol. Conserv. 12 (3): 179-201. Nov. 1977. SFA 23(1)
[Dep. Oceanogr., U.S. Naval Acad., Annapolis, MD 21402] The shad fisheries of the Chesapeake Bay in Maryland have been declining since an 1897 peak of 7860 x 10^3 kg. No periods of stability have been recorded. Data are presented to trace the decline not only as a function of specific areas within the Northern Chesapeake Bay but also in terms of environmental problems and recruitment overfishing. The problem is related to improving the commercial fishing yield. An estimation of a maximum effort of 200,000 man-hours is suggested if a stable yield is to be approached. Methods for obtaining this goal include alternating of closed fishing areas, adoption of rest days, enforcement of fisheries regulations and reduction of the number of metres of gill net used per fisherman.

78-000608 Hobson, E. S.; Lenarz, W. H. REPORT OF A COLLOQUIUM ON THE MULTISPECIES FISHERIES PROBLEM, JUNE 1976. Mar. Fish. Rev. 39 (9): 8-13. Sept. 1977. SFA 23(1)
[NMFS, 3150 Paradise Dr., Tiburon, CA 94920]

78-000609 Kent, G. EQUITY IN GLOBAL FISHERIES MANAGEMENT. Oceanus 10 (5): 60-64. Sept.-Oct. 1977. SFA 23(1)
[Univ. Hawaii, Honolulu]

78-000610 LeBlanc, R. CONCERNING CANADA'S 200-MILE LIMIT. Fisheries (Bull. Am. Fish. Soc.) 2 (4): 8-12. July-Aug. 1977. SFA 23(1)

78-000611 Roberts, K. J.; Shephard, R. J. NATIONAL OVERVIEW: NOAA'S SEA GRANT PROGRAM AND RESOURCE USERS. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 305-312. 1977. SFA 23(1)
[Natl. Sea Grant Prog., NOAA, Washington, DC]

UTILIZATION OF FISHERY PRODUCTS

78-000612 Jurgensen, K. M.; Crow, G. CASE HISTORY: THE $6-MILLION EEL, OR FROM BAIT TO DELICACY IN FOUR YEARS. Trans. N. Am. Wildl. Nat. Resour. Conf. 42: 329-335. 1977. SFA 23(1)
[Univ. N. Car. Sea Grant Coll. Prog., Raleigh]

MISC. TECHNIQUES AND EQUIPMENT

78-000613 Lundstrom, R. C. IDENTIFICATION OF FISH SPECIES BY THIN-LAYER POLYACRYLAMIDE GEL ISOELECTRIC FOCUSING. NOAA Fish. Bull. 75 (3): 571-576. July 1977. SFA 23(1)
[NMFS, Emerson Ave., Gloucester, MA 01930] Conventional electrophoretic techniques for the identification of fish species are limited in the resolution and reproducibility needed for the reliable identification of fish species. This paper describes the potential of a high resolution protein separation technique, thin-layer polyacrylamide gel isoelectic focusing (IEF), as a new means of identifying fish species. Sarcoplasmic protein patterns are shown for

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11 species of commercially important New England fishes under both low resolution (pH 3.5-10 gradient) and high resolution (pH 3.5-5 gradient) conditons. The reproducibility of the protein patterns and pH gradients from day to day is also shown. The inherent high resolution and excellent reproducibility of IEF should allow the positive identification of fish species without the costly procedure of maintaining a supply of known species for use as standards.

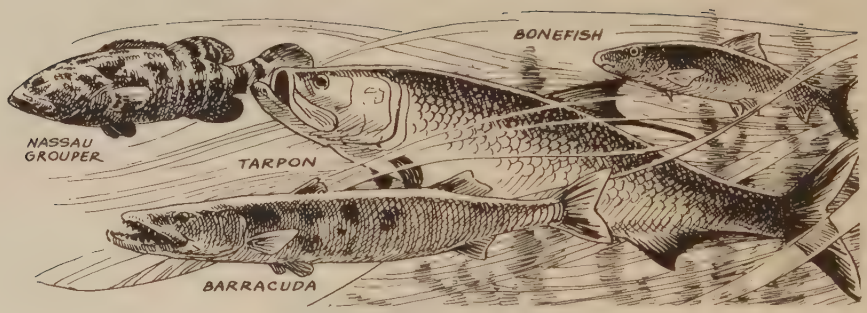
REVIEWS, BIBLIOGRAPHIES, ETC.

78-000614 Pfeifer, W. E. BIBLIOGRAPHY OF THE FISHES OF THE BEAUFORT SEA. Biol. Pap. Univ. Alaska No. 17. 76p. July 1977. SFA 23(1)
[1136 Hayer Ave., College, AK 99701]

WATERSHED MANAGEMENT

78-000615 Clark, W. F. , (ed.) PROCEEDINGS OF THE FORT UNION COAL FIELD SYMPOSIUM (5 VOL.). Montana Acad. Sci., Billings 706p. Apr. 1975. Order from Eastern Montana College bookstore, Billings, MT 59101 at $8.75 per set of 5 volumes.

78-000616 Stewart, R. E., Jr. NEW ENERGY RESEARCH IN THE FISH AND WILDLIFE SERVICE. Proc. Fort Union Coal Field Symp. Vol. 1. 81-86. Apr. 1975. SFA 23(1)
[U.S. FWS, OBS, Washington, DC 20240]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